

The Iron Age

A Review of the Hardware and Metal Trades.

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The "Waters Governor."

The accompanying cut shows a perspective elevation of the "Waters governor," which in several essential points overcomes difficulties heretofore existing in governors. The principal features of improvement are in the application of the centrifugal principle; the construction of the valve and seat, and facility of adjustment for different speeds of the engine. As will be seen by reference to the cut, the balls, two in number, instead of being attached to the vibrating arms which transmit motion to the valve, are carried by stout flat springs, whose curvature and tension are determined by actual experiment, and which are rigidly secured at one end to the revolving sleeve, which receives its motion from the shaft of the engine in the ordinary manner, by pulleys, belt or miter gears. The sleeve also supports the vibrating arms. On the free end of the spring which carries the ball, and back of the center of the latter, is a pocket for the reception of the lower or free end of the vibrator.

The motions of the balls resulting from the use of this device differ materially from those of the vibrating form. The line of expansion of the circle, owing to the peculiar curvature of the spring, assimilates a radius of the circle of rotation, and is parallel with its plane, which is stationary, though of course invariably at a right angle with its axis, while a ball attached to a vibrating arm has its line of expansion in its arc of vibration and in the plane of the axis of rotation, this necessarily changing its position in a line parallel with its axis. The advantages arising from this method of suspending balls are:

First. That as it is not affected by gravity it can be used with equal facility in any position, whether vertical, horizontal, angular, or even upside down, and can, therefore, be applied to marine and other engines which are subjected to continual change of position.

Second. By relieving the vibrating arms from all duty except the actual raising and lowering of the valve, which requires but slight motion on its axis and very little power, there is a saving of wear, and thus the great point of durability is gained. Many governors which work well when new have their effectiveness totally destroyed by the combined lost motion resulting from the rapid wear on their several bearings.

The bearing which carries the revolving sleeve is hollow, and contains an inner sleeve through which the valve stem passes, and which, by means of a feather or sliding key, is restricted to a longitudinal motion. At its top there are two collars, the lower one of which is stationary, but the upper is adjustable by means of a hand nut on the valve stem. By this arrangement all lost motion on the end bearings of the vibrators can be taken up. These bearings are simply pivoted or oscillating rectangular blocks of hardened steel, held between the jaws at the end of each vibrator. Their oscillation compensates for the curvature of motion of the latter. The valve stem having a screw thread cut on the upper portion, passes through this inner sleeve, having a nut of corresponding thread. By means of a handle at top of the stem the valve can be adjusted to any desired increase or decrease of speed while the engine is running by simply slackening the hand nut, and turning the valve stem to raise or lower the valve, as the case may be, after which the nut is screwed firmly against the collar. As it is frequently necessary to alter the speed of engines temporarily, this simple arrangement is a great convenience.

The valve and seats are made of a composition which the manufacturers claim will most effectively resist the cutting action of steam. The seats are of one piece, in the form of a bushing or cylinder, having suitable openings to admit of the free passage of the steam, and are fitted steam tight at the ends only to the interior of the outer casing shown in the cut. It is so constructed that the inequality of expansion between the two metals does not affect the seats.

The valve is cylindrical in form, and has no steam passages or ports through it, the steam simply passing by the ends or discs to the interior of the cylinder, thus establishing a balanced pressure. By means of a delicate spring the weight of the valve is supported, consequently the work to be performed by the governor is very light, so as to remove nearly all strain which, on most other valves, causes the wear and tear.

The manufacturers also claim that the large area of valve opening, in proportion to the ball-motion, obviates in a great measure the very serious feature of wire-drawing the steam, one of the worst qualities of throttle governors. The governor may be seen in space D 10, Cols. 74 and 75, Machinery Hall.

The water system of Dubuque is quite a novelty. In one of the bluffs a lead mining company met obstruction from water, and to obtain relief the bluff was tunneled, when it

was found that a copious fountain had been struck which ran to waste for several years. But the water was most excellent, the supply exceedingly liberal, and the head so elevated that the idea of utilizing it was seized by a company, the property purchased, and a system perfected which gives the cheapest and best water supply known in the country, furnishing the city for all purposes at an expense of \$8000 per year. There is also a sufficient supply to be used for water-power.

Machinists' Tools at the Centennial.

(Continued.)

THE BROWN & SHARP MFG. CO., of Providence, R. I., have an exhibit of machinists' tools, comprised mostly of special machinery, located on south aisle, near the Corliss engine. It is in charge of Messrs. Kelly & Ludwig, the Philadelphia agents for the company. The character of workmanship on all the machines included in the display is of the finest and most accurate kind, which has earned for the company a worldwide reputation. A universal grinding machine for grinding all kinds of circular work by means of solid emery or corundum wheels, up to 12 inches diameter, is made with frame or base having cored section, the interior space being utilized as a tool closet. There are two heads having centers, one of which may be made to revolve for grinding work, such as hardened mandrels, spindles, &c. The wheel is carried by a traversing slide, having transverse as well as longitudinal feeds and adjustments. By means of an additional slide the machine will admit of straight and curved taper adjustments without changing the line of centers, which are regulated by worm and segment, the latter being graduated in degrees. A special chuck for holding work requiring internal grinding is furnished with the machine. A universal milling machine having an index attachment for cutting gears of any pitch up to 13 inches diameter is shown, together with vice and chuck for holding work which cannot be placed upon the centers. The machine has all necessary adjustments, and automatic feeds in every direction, including right and left spirals. Two turret screw machines, sizes No. 1 and No. 3, contain the latest improvements for convenience and rapidity in the manufacture of machine screws of all kinds. No. 1 is suitable for general use in machine shops, making the finished screws from bar iron, beside drilling,

as often as required. The company also an exhibit of small tools, such as United States standard scales, squares, gauges of all kinds, &c., which will be noticed when the class to which they belong is under consideration.

J. HAMMOND GRAY, of Philadelphia, Pa., exhibits one of the larger sizes of his patent screw machine; also a full line of samples of the different varieties of work of which it is capable. The machine is intended for general shop use, for sizes from the smallest screws ordinarily used to bolts and studs up to one inch diameter. The head containing the different tools for the several operations necessary in making a finished screw from bar iron, revolves horizontally, and is, in this respect, different from the turret machines, in which the axis is vertical. The hollow mill for turning or milling the body of the screw (which is done by a single operation) contains but one cutter, which may be detached when dull and ground on an ordinary grindstone. These cutters are furnished all ready for use, requiring

the improvements and conveniences of power tools which can be profitably applied to machines of this class. The exhibit includes a 12 inch swing engine lathe for screw-cutting for pitches of threads from 6 to 60 per inch. A treadle and four speed cone fly-wheel are attached. A foot-power hand lathe of 9 inches swing has also treadle and fly-wheel complete. Several other sizes of lathes for foot and power, among which are a 9 inch hand lathe, and a similar one on short legs for using on the work bench. An upright lever drill, also for bench use, appears to be a very handy tool for light work. A power post drill, being, with the exception of having no base, what is usually known as the goose-neck column pattern, is intended for fastening to a wooden post and economizing floor space. It has a radial arm carrying a revolving table, and having a rack and pinion vertical adjustment. There is also a column drill of the same size and design, but having the full length column and base plate. Messrs. Kelly & Ludwig are the Philadelphia agents for the firm, and are in charge of the exhibit. The location of the space is in Sec. C, Col. 29, Machinery Hall.

Working Heavy Guns.

Guns.—The Engineer says that an official trial was made recently at the Royal Arsenal, Woolwich, of an apparatus for working heavy guns by means of steam-power, from which great advantages are expected to result. "A full-sized model of a casemate battery had been constructed in the mounting ground of the royal carriage department, and in it had been placed one of the 38 ton guns recently fired at Shoeburyness, the aid of steam-power being ingeniously brought to bear in the mounting of the gun and its appurtenances, as well as in their subsequent action, by Mr. Butter, manager of the carriage department, by whom the apparatus has been designed and prepared. The machinery consists principally of a bevel wheel arrangement inserted in the bed of the platform under the carriage, and it is found that an engine of about 8 horse-power is sufficient to work it. The gun was traversed right and left with great facility. It was run back, sponged and loaded, all by steam-power alone, four or five workmen being sufficient to work the machinery. The shot was conveyed to the muzzle of the gun by an overhead traveler, and was then met by the head of a rammer which is worked by a peculiar chain from below. The chain has its links united by a side joint which gives it flexibility on one side only, and converts it into

a stiff bar when turned on its back, thus enabling it to drive the shot home, and then return to its place in a coil under the gun." The working of heavy guns by steam, it would seem from this, is a novelty in England. In this country it is no new thing. Col. Stevens, when he first designed the Stevens Battery, proposed to load and train all the guns by steam-power, and since that time several plans for the same purpose, we believe, have been perfected.

An Englishman on Train Brakes.

We quote below from a letter to the London Times upon railway brakes, which well describes the state of things prevailing in England. To this matter English scientific magazines have repeatedly called attention, yet the slow-going directors do not seem to understand nor care. It would seem that the cost of accidents alone would be enough to make the value of the different descriptions of American power brakes apparent to English railway managers.

English and American railways present, at one point, a marked and, to an Englishman, a humiliating contrast. We have failed to establish any proper control over running trains. The Americans have established a control which is almost perfect. After 50 years' experience

we still employ for stopping our trains the rude and ineffectual methods which were in use at the very dawn of railway traveling. The Americans employ a mechanism which bears to ours about the same relation which the breech loading rifle bears to the flint lock and smooth bore, or to the bow and arrow of the past.

When the driver of an English train sees danger before him he shuts off steam. His fireman begins in haste to turn a lever. The guard, warned of impending peril, makes his way as quickly as possible to a similar lever at another part of the train. In 10 to 15 seconds the combined efforts of fireman and guard have applied the brake to 14 wheels, probably one-fourth of the number present in the train. Meanwhile, the space which intervenes between the rushing train and the obstacle which threatens its destruction has diminished with fearful rapidity. An English train running at full speed cannot be brought to a stand under 1100 or 1200 yards, and that is seldom afforded in cases of accident. Ordinarily, the feeble action of our brakes is cut short by a shattering collision, and the death or injury of many of the passengers.

In presence of similar danger the American driver touches slightly a little handle which stands up before him. In less than two seconds every wheel in the train is grasped by a powerful brake, and before the train has traversed a distance greater than $1\frac{1}{2}$ times its own length it is brought to a stand. A train running even at our high English speed is stopped easily in 15 seconds, and within 600 feet of the point where danger was discovered.

Many accidents occur with us from wagons breaking away upon inclines and running back uncontrolled. The American brake renders such accidents impossible. The separation of one portion of the train from the rest causes, without any human agency, the instant application of a brake to every wheel in both sections. Last week an accident of this class occurred on the Midland line. The American brake would have had the whole train at a stand within a few seconds of the separation. As it was the driver held on his way ignorant that anything was wrong, and his disjoined wagons followed him on a down grade. When at length he stopped they struck him with great violence. Just as the collision occurred the Scotch express, which on the Midland is fitted with an American brake, rushed past at full speed. One of the carriages struck the projecting debris of the wreck. That contact put the brakes on to the whole express train almost before the driver was aware of the accident.

The American conductor has power to apply the brakes from any car of the train without waiting for the concurrence of the driver. The same privilege is extended to the passengers, but few of them are aware of it, and it is never availed of. The conductor applies the brake without requiring steam to be turned off. So powerful is this brake that the stoppage of the train is not perceptibly delayed even by the impelling force of the steam. I conversed recently with many drivers and conductors of the American trains upon the subject of brakes. Their testimony was unanimous and most emphatic. Not one of them would consent to take charge of a train which was not fitted with a continuous air brake. It was curious to hear a rugged engine driver in the wilds of Kansas or Nebraska declare that he would not expose himself to the risks which the supineness or parsimony of railway directors still lays upon the whole English people.

It costs \$138 (about £25) to fit one of the large American cars with the air brake. But I am assured that it saves its costs annually by the prevention of accidents. Railway traveling has been much less dangerous in America within the last few years. Americans claim that notwithstanding inferiority of roadway and rolling stock, they now travel more safely than we do; and they assert that this is owing in no small degree to the use of an efficient brake. If railway directors think they practice economy by the use of the obsolete and dangerous hand brake, they are surely not wise in their generation.

The air brake has been generally used in America for about four years. During these years how many lives have been lost on English railways, because the driver was not furnished with means to stop his train in time to avoid collision? How many English homes are yet to be desolated before our railway directors will consent to surround with proper defense the precious lives intrusted to their care?

A pneumatic railway, for the dispatch of messages between Paris and Versailles, just completed, is nearly $13\frac{1}{2}$ miles in length. The tubes, made of brass, are $3\frac{1}{2}$ inches in diameter and two-fifths of an inch thick. They are laid at a depth of 8 feet from the surface, on a flooring of wood, and are pitched both inside and out.

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Steam Engine Cut-offs at the Centennial.

(Concluded.)

THE "WHEELOCK" ENGINE, manufactured by Jerome Wheelock, Worcester, Mass., may be seen in operation in Agricultural Hall, where it is used for driving one of the lines of shafting for operating the machinery on exhibition. It is described with a view to overcoming what the manufacturers consider to be radical defects in the action of the "Corliss" and "Harris' Corliss" engines, the principal one of which being the necessity for the use of four parts (separate steam and exhaust at each end of cylinder), and the consequent blowing through while the exhaust is open in case the steam cut-off valve happens to leak. Experience in the use of these engines will determine whether or not the point is well taken, while for ourselves we refrain from expressing any opinion on the subject, comparative criticisms not being within our province. Without doubt the Wheelock valves are admirably adapted to the accomplishment of the object for which they were designed, the principles involved in their action covering several important points which are absolutely essential to the attainment of a maximum degree of economy in the use of steam. A front view of the engine bears a close resemblance to the Corliss type, although the absence of the cut-off valves at the top of cylinder removes the necessity for the square corners, and allows of a more symmetrical design than can be obtained where the latter occur. Another noticeable difference is in the guides, which—although like the Corliss, parallel with the plane of vibration of the connecting rod—have in place of the V bearing a curved one, made by boring them on the line of the axis of the cylinder, thus insuring perfect accuracy and preventing any possibility of the piston and cross head being out of line in either direction. The valves are four in number, a main and a cut-off valve at each end of the cylinder, the former being operated by an eccentric in the ordinary manner, while the latter, although receiving motion from the same source, are controlled by the governor, and are therefore automatic in cutting off. Although all are of the rotary, or more properly the oscillating, form, the main valves perform both functions of induction and evaporation while the cut-off valves have but the one duty implied by the name. The seats of the latter are as close to the backs of the main valves as is consistent with the proper allowance of metal between, which, in connection with the position of the main valves directly under the end of the stroke, with only the thickness of the cylinder between, reduces the percentage of clearance to a very low figure. As after the opening of the exhaust both the main and cut-off valves at that end of the cylinder are closed to the steam, a double barrier is opposed to any chance of leakage or blowing through of live steam into the exhaust, this feature constituting the main claim of superiority. The valve motion is very ingenious and effective, although of the utmost simplicity. The cut-off is effected by tripping the valves (the necessary dash-pots being attached to prevent jar) by means of lugs on the lifters coming in contact with the spring catches which engage rock arms on the valves. The position of these lugs in relation to that of the piston is regulated by the governor (the latter being of the centrifugal form and driven by belt from crank shaft), whose variations are transmitted to a rod attached to the lifters, giving it a lateral motion, which, by drawing the lugs forward as the speed increases, shortens the point of cut-off by tripping the valve earlier, and *vice versa*. The action of the engine is exceedingly smooth and quiet, and gives evidence of the careful workmanship employed in its construction. The whole finish of the machine is excellent, and its fine appearance occasions much admiration from visitors.

ROBERT WETHERILL & CO., of Chester, Pa., exhibit a very fine specimen of the Corliss horizontal type of engine, containing all of the latest improvements. A very excellent feature of the engines made by this firm is the flat cast iron bed plate, when by tying the feet of cylinder and housing together at the bottom gives greater rigidity, and lessens the danger of springing the housing and throwing the bearings out of line when setting it on the foundation. As the principle of the Corliss engine—the pioneer of automatic cut-offs—is so universally known, any description of it would be superfluous. The workmanship and finish of this engine are excellent, and reflect much credit on the builders. It is to be regretted that it is not shown in operation, as without doubt its action would fully coincide with its appearance. The exhibit is located in the space east of the Weimer high speed blowing engine, which has a way of its own of making its whereabouts known to visitors.

MIRLESS, TAIT & WATSON.

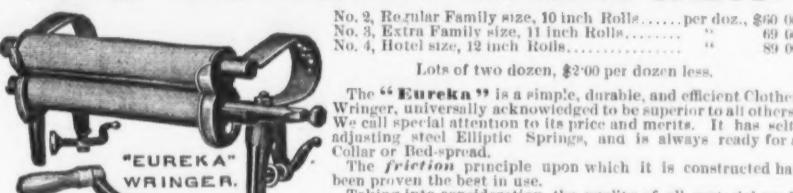
In the British section of Machinery Hall the above firm, of Glasgow, Scotland, exhibit in connection with their large sugar mill a Corliss beam engine, having the style of cut-off originally adopted by the inventor.

In the Belgian section is a pair of geared horizontal condensing engines of the recent Corliss type, which as specimens of workmanship will compare favorably with the best of either foreign or American build. The condensers and air pumps are placed directly in the rear of the steam cylinders, the piston rods passing through the back cylinder heads and connecting directly with the air pump pistons. By this means the necessity for complication in operating the air pumps is avoided, and the engine rendered as compact and simple as possible. From their prominent position on the main aisle, the fine appearance due to excellent finish causes these engines to be much admired, and considerable astonishment is expressed at their style of finish, which is unusual in connection with this class of machinery in European practice.

GOLDIE & McCULLOCH,

of Galt, Ontario, Canada, exhibit in the space on main aisle, directly opposite the main entrance to the building, a horizontal variable cut-off engine, which appears to embody several very meritorious features. The design is good, and excellent judgment is displayed in the distribution of metal in both the stationary and working parts. The main valve is of the ordinary slide form, made without steam lap, and operated in the ordinary manner by an eccentric on the crank shaft. The cut-off valves, one for each end of cylinder, are gridiron slide valves, having a vertical motion on independent steam chests placed upon the back of that of the main valve. Their motion is derived from a longitudinal shaft revolved by gearing from the crank shaft. It is placed directly under the centers of the valve stems, and carries two spiral cams of the requisite form for raising the valves and dropping them quickly, a dash-pot or air cushion being attached to prevent slamming. A bevel gear upon the cam shaft drives the governor, which is of the centrifugal form, and capable of developing considerable power. The rod of the governor connects by means of an L lever and rods with the lifting cams. As the speed increases the cams are moved back, and the spiral being on the drop side, the interval of opening of the valve is decreased to the required point. In case of any sudden lightening of load on the engine, the positive motion of the governor would move the cams far back as to clear the valve stems altogether and allow them to remain closed until the speed became reduced. The raising side of the cams is necessarily parallel with the shaft to insure a uniform lead, and the highest point is reached as quickly as possible without causing undue friction. On the drop side the angle of the edge is a radius of the circle, and as turning the cam backward would break the valve stems, a clutch is provided on the shaft which admits of motion in but one direction.

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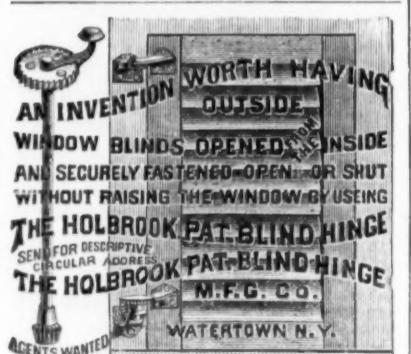
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Flat Bars up to 6x2. Rounds and Squares up to 4 inch, Ovals, Half Ovals, Half Rounds, Box Iron Cylinder Bars, Plow Beam Iron, &c. Also, Hoop, Band, Horse Shoe and Shafting Iron of superior quality. A full assortment in store after February 1st.

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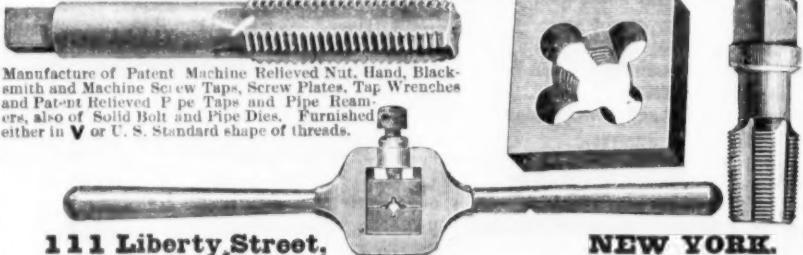
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SPRING STEEL AND WIRE of all kinds,

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PROPRIETORS OF THE

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Having introduced New and Improved Machinery into their Rolling Mills, and manufacturing all their Iron from the ore, and also doing all Machine Work and Repairs in their own shops, they are enabled to produce

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Of all Patterns and of uniform quality, unsurpassed for strength and wear, and of any required length.

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The annexed cut shows one of the many styles of Coffee Mills of our manufacture, especially adapted to Grocers' use and all retailers of coffee. They are highly ornamental, and workmanship of the very best. Silver Medals awarded at the Great Fair of American Institute last autumn. We make more than 30 styles.

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Will roast 30 to 40 lbs. at once, and can be used as a stove at other times.

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Proceedings have been commenced against said Imhaeuser & Co., for selling clocks contrary to the order of the Court, and especially the clock with a series of springs in the cover, and marked "Patented Oct. 20th, 1874." All persons discovered using these infringing clocks will be dealt with according to law.

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Awarded the GRAND MEDAL of PROGRESS at WORLDS' EXPOSITION, VIENNA, 1873, being the highest awards on Pumps, &c., also, highest medal at PARIS in 1867.

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UNION MANUFACTURING COMPANY,

Manufacturers of all styles Plain and Ornamental Butts,

LOOSE PIN REVERSIBLE,

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Drilled and Wire Jointed.

Japanned, Figured Enameled, Nickel Plated

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IRON & BRASS PUMPS,

Cast Iron, Well, and Force Pumps, Yards, Drive

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Designed specially for pumping sand, gravel, &c., in large quantities. Pumps from 150 to 40,000 gallons per minute capacity. Send for circular.

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Retail Yard on D. L. & W. Railroad, cor. Grove and 19th Sts., Jersey City. Coal delivered direct from Shutes and Cars. Wagons. Families and manufacturers supplied with the best quality coal at the lowest rates.

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AN INDESTRUCTIBLE COATING FOR

IRON, TIN, OR WOOD,

For Sale by the Trade and

PRINCE'S METALLIC PAINT CO.,

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Caution.—As certain parties are offering for sale a SPURIOUS PAINT, under an imitation name, purchasers will please see that our TRADE-MARK is on every package. None other genuine.



Merchant Iron at the Centennial.

(Continued.)

MESSRS. REESE, GRAFF & WOODS, of the Fort Pitt Iron and Steel Works, Pittsburgh, in addition to their steel exhibit, of which mention is made under its appropriate head, show samples of their iron, both in its various forms of merchant iron, and worked into shapes and other forms. The bar iron shown is bent and twisted to indicate its toughness and bent to show fiber. Various shapes for agricultural purposes are shown, as well as horse-shoes and toe calks. The iron from which the horse-shoes are made is rolled on the only rolls in the world, it is claimed, that can roll bar iron with irregular lateral sides. They also display shingle strips, which are largely used in the lumber regions all over the world.

MESSRS. MOORHEAD & CO.,

of Pittsburgh, Pa., who divide with a Philadelphia house the credit of being the largest galvanizers of sheet iron in the country, make a very tasty display of common C. H. and Juniata black and galvanized sheet iron, both in the sheet and worked up into cornices, shovels, stamped ware, and roofing and ceiling iron. The display is in the form of an arch, the base, facade, cornices, &c., being of galvanized iron, and the balance of black sheet. The top is beautifully ornamented with cornice work in various designs made from their galvanized sheet, and the whole is surmounted with a large spread eagle, gilt, also stamped from their iron. The roof of the arch is utilized to show the roofing and ceiling iron, and the corners to display it, bent into pipes and tubes. This firm make a specialty of sheet, plate and tank iron, making no bar iron. Their sheet iron has the merit of being perfectly uniform in quality, and stands high in favor with the trade. Their galvanized iron is the standard for comparison, both in quality and finish, while their black sheet, shovel and stamping irons rank equal to any in the market. Beside the ordinary sizes of sheet displayed there are two sheets worthy of notice on account of their extra large size, one of black iron, No. 24x38x144 inches, and one of galvanized iron, No. 23x4x120 inches, being the largest sheets of that gauge manufactured by any mill. They also show a piece of tank iron 10x54x216. Though no samples are shown this firm have facilities for the manufacture of armor plate, and have furnished it 12 inches thick by 5 feet wide and 12½ feet long.

THE DANVILLE IRON CO.,

Danville, Pa., exhibit in connection with the display of irons of which C. W. & H. W. Middleton are the agents, some samples of railroad iron. This firm make rails exclusively, and their mill has a capacity of 12,000 tons per annum.

The exhibit of

THE McCULLOUGH IRON CO., of Philadelphia, is in the Main Building (the exact location being column P, No. 70), and is a fine display of the ordinary and special varieties of their well known products. They present for examination samples of best galvanized "Chetwynd" galvanized iron, headed roofing plates, best bloom and best refined sheet iron (Harvey's patent cleaned) as also a polished iron for stamping purposes. The iron to be galvanized is manufactured at the mills of the company in Cecil county, Maryland, where they own and operate an extensive forge of 18 furnaces, using an immense quantity of charcoal in the refining process. The blooms produced are all consumed in supplying the bar which eight pairs of sheet rolls (20x40) work up into sheets. These rolls are placed in four separate mills; four trains at Octoraro Mill, on the Octoraro Creek, at Rowlandsburg; two at West Anwell Mill, near Elkton; and one pair each in Northeast and Stony Chase. The number of men employed in all their works is about 500. The finished sheets from these mills are sent to the galvanizing works of the company, at Sixteenth street and Washington avenue, Philadelphia, where they are galvanized, and thence shipped to all parts of the country. This company was the first in the United States to galvanize sheet iron, having begun the business in 1852, importing skilled workmen from England; and such has been the unusual care, intelligence and skill displayed in manufacturing their iron, that they maintain a well deserved reputation for producing an article of uniform and unsurpassed excellence. Their best refined iron is manufactured at Wilmington, Del., where they have recently put into operation a large new rolling mill called the "Minqua" Works. Being fitted up with all the modern conveniences, and containing 3 trains of 23x44 sheet rolls, they turn out at this mill a superior quality of sheet iron. We notice that the McCullough Iron Company style themselves successors to the Principio Company, of England, which was established at North East, Md., about 1720, as they own portions of the same land which the Principio Company owned, and the forge at North East is located on the same spot where the old forge once stood. The latter company was the first to erect iron works in Maryland, and grew to be an extensive concern, having forges and furnaces in Cecil and Baltimore counties, Maryland, and a furnace in Virginia. Great interest attaches "in this Centennial year" to this old company from the fact that two of its members were Augustine and Lawrence Washington, the father and brother of George Washington, and it was on the elder Washington's land in Virginia, along the Potowmack, that the furnace of the Principio Company was built. A number of the books and letters of the old company are still preserved, containing many interesting items not only in reference to the Washingtons, but also to the state of the iron industry in those early times. The surplus bar and pig iron produced by the Principio Company, after the wants of the Colonists were supplied, were sent to England, and as a historical relic may be mentioned a bill of lading for "22 tons of pig iron," shipped to London in 1748, the imprint on the bill itself stating that it was "printed by B. Franklin, over the post office near the market."

The Philadelphia and Reading Railroad exhibit in the Main Building a very interesting series of ores and fluxes, and from their rolling mill piles, blooms and rails manufactured from the same, as well as some solid steel rails rolled in their mill from Siemens-Martin steel furnished by the Midvale Steel Works, and some steel-headed rails made under the patent of Mr. W. E. C. Cox, the superintendent of their rolling mill. Some of the old iron rails exhibited show conclusively that iron rails well made have a life far in excess of that generally allotted to them. One rail, 64 lbs. to the yard, was placed in track June, 1870, and removed April, 1876, carrying in that time 56,300,000 tons. Another rail of same section, and having endured the same traffic, is shown twisted cold. The analysis of this rail is as follows:

Phosphorus..... 0.422
Sulphur..... 0.032
Silica..... 0.392
Manganese..... 0.164
Carbon..... 0.027
Iron..... 98.963

The Philadelphia and Reading Railroad Company's Rolling Mill, at Reading, Pa., was built in 1867. The first rail was rolled in March, 1868, and the product since that time to June 1, 1876, has been iron and steel rails, and splice plates, the capacity being 20,000 tons per annum, and the average yield 17,000 tons. The building is 90 feet span, 30 feet to the square. The main building is 420 feet long, to which are attached two wings, one 180 feet, the other 90 feet long. The works consist of 12 single puddling furnaces, with one plain cylinder boiler 36 inches by 30 inches over each; 8 heating and 2 reheating furnaces, with two plain cylinder boilers 36 inches by 30 inches over each; one supplementary boiler; three vertical engines, with 40 inch by 40 inch cylinder, and fly-wheels 30 inches in diameter, weighing 70,000 pounds each, driving the 23 inch roll trains; one puddle train of rolls, two sets, three-high, 23 inch diameter rolls, to which is attached a rotary squeezer; one train, three sets, three-high, 23 inch diameter rolls; one set for breaking down old rails and puddled bar, one set for covers or head bars, and one set for bloomming the rail pile; one train, one set, two-high (with arrangement for three-high), 23 inch diameter rolls, for finishing the rails; one train, one set, three-high, 12 inch rolls, for rolling crop ends of rails, splice plates, &c.; one horizontal engine, 24 inch by 30 inch cylinder, for driving the 12 inch rolls, two blast fans, two circular saws, friction rollers, rail elevator, straightening machine, two punching machines, rail drill, and hot shears; one steam old rail shears; two steam hot shears. Injectors are used for feeding boilers with water. In close proximity to the mill is a building 60 feet by 100 feet, containing a carpenter and pattern shop, in the latter is a machine shop, and a blacksmith shop; in the former is a foundry, and a forge. The engine drives a roll turning lathe, two lathes, drill, planer and fan. In the rolling mill the heating of the iron is done with anthracite coal; the puddling with anthracite coal or a mixture of anthracite coal dust and bituminous coal.

HORACE A. BEALE & CO.,

of Parkersburg (Pa.) Forge and Plate Mill,

exhibit samples of their specialties of plate and tube iron, which they state are not made from special stock simply for exhibition, but are of the same material as they use in their everyday operations.

Their specialty is tube iron, for which they claim an equality with any made.

Samples are shown bent cold, without annealing, which certainly testify to a high grade of excellence. They also manufacture a grade of

The display of

W. D. WOOD & CO., Pittsburgh, at T 61, Main Building, is not only attractive as a display, but it is a trophy of American ingenuity and pluck, conquering success in spite of the most decided obstacles. The exhibit is of Wood's patent planished sheet iron. Through the middle of the space extends a representation of a locomotive boiler made of their iron, crowned with a U shaped corrugated pipe, with a display of pans and various articles made from the iron. In one corner of the space a machine is at work making the corrugated elbow, and the whole is surmounted with a fence of unique design, all of which, post, balustrades, rails, etc., are made of this planished sheet. But it is not so much the way it is exhibited as the iron itself that we wish to speak, and in spite of the prejudice that has grown up in favor of the imported Russia sheet iron, we have no hesitation in saying that it is fully equal to the best Russia iron ever brought to this country. In appearance it is far superior, as a comparison of the locomotive boilers in Machinery Hall will very soon show. Its use is driving the imported iron out of the market. During the past two years 25,000 packs have been manufactured and sold. The principal railroads in the country use it exclusively on their locomotives. The jackets of the air pumps of the Westinghouse are all made of this iron, displacing the Russia. N. & G. Taylor, of Philadelphia, large importers of metals, say of it: "The American planished iron is far, very far, superior, is more lasting, possesses a better finish, and can be made and sold much cheaper." We are aware that these statements may be received with a look of incredulity. Every year for the last fifty has produced an iron that equalled the Russia, but somehow we soon hear the last of it. True as this may have been, we are convinced from our own observation and the testimonials that we have seen, that Wood's patent planished is in every respect the equal of Russia and in finish superior. If anyone doubts this we advise them to send for one of their circulars, and if any reliance can be put in human testimony they will be convinced. This iron is made exclusively from the best hammered charcoal bloom iron, made in their own works, and is finished under a planishing hammer weighing about 3 tons, and striking 300 blows per minute with an estimated force of about 20 tons to each stroke. The planishing process imparts to it that beautiful gloss and dappled appearance of the celebrated Russian sheet iron, and closes the pores of the iron so effectually that it will resist the action of the atmosphere fully as long.

Brazil and its Products.—The *Piper Trade Journal* has taken pains to collect some very interesting items relating to the productions of Brazil, which will in the future be a source of vast wealth to that country. All intelligent travelers who have visited Brazil speak in the most glowing terms of the country. Professor Agassiz regarded it as the most productive and interesting country on the globe, and the one in which it is the easiest to obtain a livelihood. Some who have sailed up the Amazon declare that a vessel can be loaded with Brazil nuts at an expense of only a few cents per bushel. These constitute a valuable article of commerce, while the oil extracted from them is very desirable. All the tropical fruits are produced in Brazil almost without cultivation. The soil in many parts of the country will produce 20 successive crops of cotton, tobacco, or sugar cane, without the application of manure. No country in the world approaches the land of Dom Pedro in the variety of its forest productions. Professor Agassiz states that he saw 117 different kinds of valuable woods that were cut from a piece of land not half a mile square. They represented almost every variety of color, and many of them were capable of receiving a high polish. One tree furnishes wax that is used for candles; another a pitch that is used for food; and still another yields a juice which is used in the place of intoxicating liquor. There is a single variety of palm from which the natives obtain food, drink, clothing, bedding, cordage, fishing tackle, medicine, and the material they manufacture into dwellings, weapons, harpoons and musical instruments. Doubtless the day is not far distant when the valuable woods of Brazil will be used for various useful and ornamental purposes.

The *Railroad Review* has, in a recent issue, some very interesting items concerning quick runs made last month on some of the Western roads. Remarkably fast time was made by a train on the Canada Southern Railway, from Amherstburg to Buffalo, August 21. The distance, 229 miles, was made in four hours and fifty minutes. This time included fifteen stops, one of which was fifteen minutes at St. Thomas for supper, and two for wood and water. The first 112 miles, from Amherstburg to St. Thomas, was made in two hours and ten minutes, including two stops. Deducting time consumed by stops, the actual running time for the entire distance was at the rate of sixty miles per hour. This is probably the fastest time ever made in this country for a run of such length, and the performance is worthy of record. A fast run was made Aug. 12 on the Toledo, Wabash and Western Railway, from Fort Wayne to Toledo. The average speed was nearly forty-five miles an hour, including stops, or 47 miles per hour. The fastest time between stations was 10:2 miles at the rate of sixty-five miles per hour. The train consisted of one baggage car, one 8 wheel coach, one 12 wheel Pullman sleeper, and a 12 wheel Pullman.

The Pacific Mail Steamship Company's steamer City of Peking made the remarkable

passage from Yokohama to San Francisco—a distance of 5000 miles—in 15 days, arriving at the latter port Sept. 1. This is a daily average of 337 miles, or 14 miles per hour, and brings

Liverpool, via the Pacific Railroad and North Atlantic steamers, within 3

USE THE BEST.



Pawtucket, R. I.

The American File Company have the exclusive right to use the Bernot process for cutting files. By this method all the advantages of hand cutting are secured, together with an accuracy unattainable in hand work. They are the only manufacturers who employ machinery for testing files and steel.

Goods of all known manufacturers have been repeatedly tested, and interesting tables have been compiled showing the working qualities of files made by different makers, and of files made from different steels, and with various shapes and angles of tooth. They have thus reduced the manufacture of files to an exactness and perfection with a uniformity of result, as they believe, never before attained. No file, foreign or domestic, that they have ever tested, has equalled the performances of their own goods taken at random from their stock. Their machines are capable of the most delicate adjustment, and can produce the very finest work known to the trade. Special files made to order. Prominent file manufacturers are having their best goods from our works.

Price lists and information furnished on application.

AMERICAN FILE CO., Pawtucket, R. I.

THE BEST IS THE CHEAPEST.

McCaffrey's Standard American Hand Cut Files and Rasps are warranted to do more work than any other files and rasps in the market.

SILVER MEDAL



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HIGHEST PREMIUM.



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We invite the attention of the trade to our Celebrated American

HELLER & BROS.
T M
NEWARK, N.J.

Horse Rasps
and Files,

made from the very best American Steel, all cut by hand, and warranted to give entire satisfaction. If required, we will send samples to be examined, and subject to our own inspection, free of all charges, if not found as represented. All Rasps not stamped as the annexed incorporated trade mark are not genuine. Sold by Hardware dealers generally.

Established 1868.

FILES &
RASPS,

Best Cast Steel.
HAND-CUT. Manufactured by
JOHNSON & BRO.
No. 1 Commercial Street, Newark, N. J.

Established 1835. TRADE MARK ON

New Pattern

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MATTEAWAN

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HAND-CUT FILES AND RASPS,

Made from English Cast Steel.

JOHN & WILLIAM ROTHERY,

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Putnam's Government Standard
FORGED

Hammer Pointed
HORSE SHOE NAILS,

READY FOR DRIVING.

Manufactured from the best of NORWAY Iron, and warranted to give entire satisfaction.

S. S. PUTNAM & CO.,
NEPONSET, MASS.

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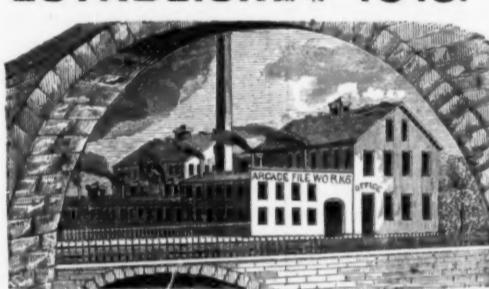
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HAND CUT



FILES and RASPS
Made from Best
ENGLISH CAST STEEL.
Quality guaranteed by written warranty
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AUBURN FILE WORKS,

Superior Hand-Cut

FILES AND RASPS,

MADE FROM IMPORTED STEEL. EVERY FILE WARRANTED.

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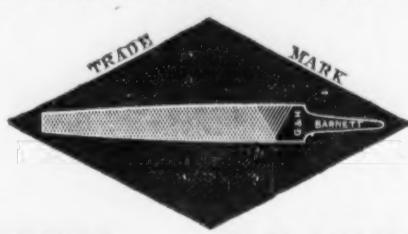
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WEST CHELMSFORD, MASS.,
MANUFACTURERS OF EVERY DESCRIPTION
OF
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GENERAL AGENTS.

All Goods Warranted.

Black Diamond File Works.

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LINFORTH, KELLOGG & CO.
Sole Agents for the Pacific Coast, 3 & 5 Front St., San Francisco, Cal.
St. Louis, Mo., SEMPLE, BIRGE & CO., Agents.
THOS. TAYLOR, 43 Chambers St., N. Y., Agent for N. Y. and N. E. States.

Established 1816.

Peter A. Frasse & Co.,
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SOLE AGENTS FOR

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FILES AND HORSE RASPS,

And Importers of

P. S. STUBS' FILES, TOOLS & STEEL,
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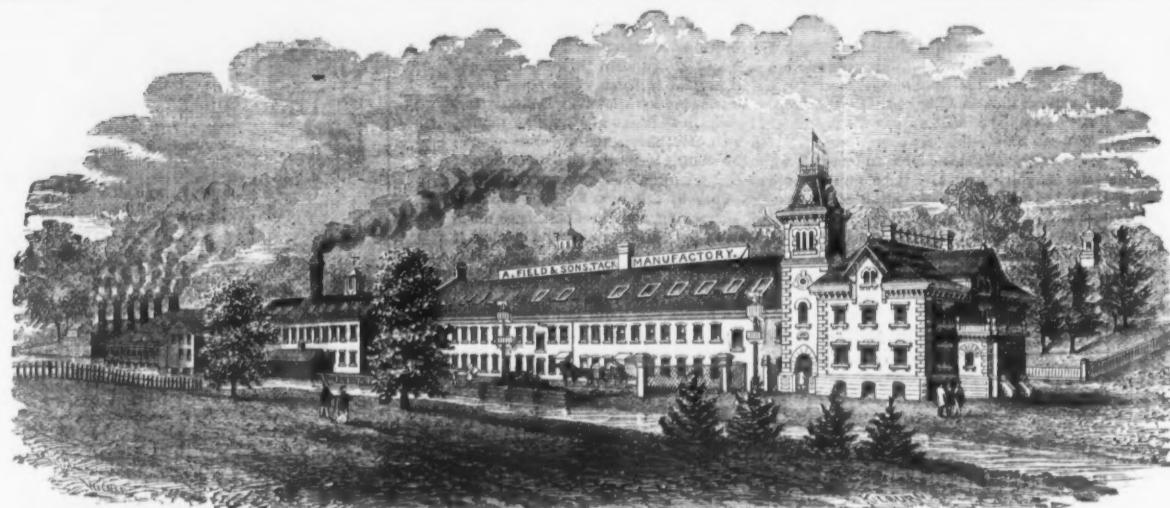
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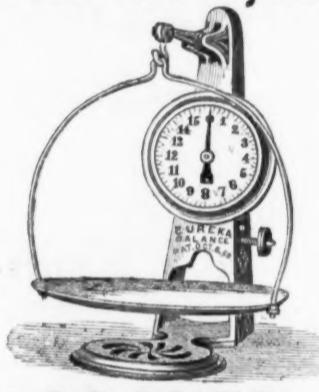
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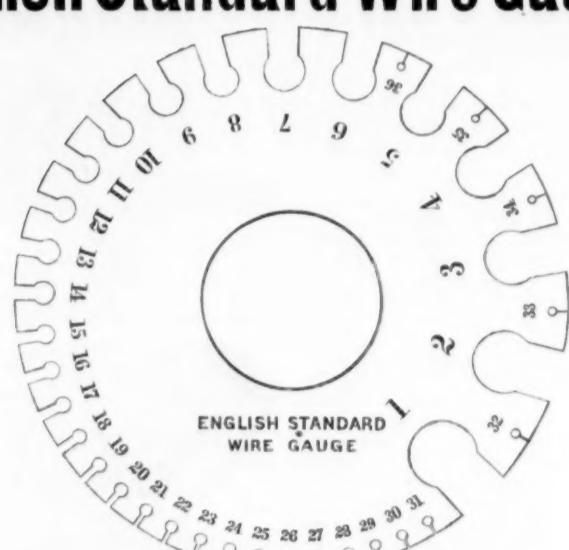
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Steam-power for Street Railroads.

For some time past a steam car, or as it is sometimes called, dummy, has been running on Market street, in Philadelphia. It has attracted considerable attention and general approval. It is known as the "Baldwin" car, and was built last November in the Baldwin Works, Philadelphia. The car is owned by the firm, and was first run last fall on the West End Railway. It was then taken to Brooklyn, and was used there during the winter. The car is of the ordinary size, 16 feet long. The two cylinders, each 6 inches in diameter, with a 10 inch stroke, are beneath the car. The upright boiler stands as if in the door of the ordinary horse car, half within and half outside. The valves and levers are in front, the upward platform not being unlike those usually seen on the cars now in use. The inner half of the boiler projecting into the car occupies little room, is covered with attractive mirrors, and by the unobtrusive might be regarded as an ornamental feature of the car. To be shut off from the clatter of horses and the shouts of the driver is a decided advantage in street-car travel. The much feared smoke nuisance is entirely avoided by the use of anthracite coal, and the noise which usually proceeds from a locomotive is prevented by a noiseless exhaust, an original device perfected in the Baldwin Works. The much dreaded noise, which it was supposed would frighten women, children and horses, has been shown to be a chimera, and, in response to numerous requests from those living on the line of the road, the steam car has been provided with bells to warn people from the track. The temperature, too, can be greatly improved in cold weather with the heat of the boiler.

The Philadelphia *Times* says: The average cost of the horse car now used in that city is \$1100. Eight horses a day are required for each car, which have a combined value of \$1080; four sets of harness cost \$80, making the entire cost of car and equipment \$2260. The steam cars ready for use can be built for about \$2800. The horse cars last, on an average, about ten years; the propelling machinery of the steam cars will last as long, and probably longer, and when it is known that the average life of the horses used in the street railway service is only three years, it is seen, that, as regards first cost, the steam cars have a decided advantage.

The car now running in Market street consumes about 500 pounds of anthracite coal a day, worth \$1.65; the daily expense of feeding and care of eight horses in the stables of the West Philadelphia Railroad Company is \$4.40, or a yearly difference in favor of each steam car of \$1003.75. No account is here taken of the cost of stables, cars, etc. The number of men required for running the steam car is the same as for the horse car—a conductor and driver. The superintendent of the Baldwin Works says that the car now in use in Market street has been run without difficulty 20 miles an hour. The president of the West Philadelphia Railway Company is much pleased with the results of the experiment. The Baldwin steam car is attracting considerable attention in other cities, and one of them has been ordered by the Citizens' Passenger Railway, of Baltimore. Some gentlemen from Cuba have a steam motor constructed on the same principles, to be used in drawing passenger cars in the streets of Havana.

Dry Dock at Philadelphia.

From the *Journal of the Franklin Institute* we take the following particulars in regard to the dry dock of Messrs. William Cramp & Sons:

For many years the commerce of Philadelphia has felt the great want of proper facilities for docking large vessels for repairs, there being no private docks except two small floating ones, quite too small to accommodate vessels engaged in our foreign trade. The floating dock at the old navy yard was sometimes allowed to be used for merchant vessels, but the formalities and uncertainties attending its use, the remoteness from shipyards and shops, made its use expensive and unsatisfactory. To meet this want Messrs. Wm. Cramp & Sons determined to construct at their shipyard a dry dock of sufficient size to take in the largest vessels that enter this port. The water of the river being fresh it was determined to construct it entirely of wood.

The dimensions are as follows: Length from head to gate, when in position, 430 feet; length of keel blocks, 420 feet; width at bottom amidships, 45 feet; width at top amidships, 111 feet; width at gate, 70 feet; depth, 26 feet; depth below high tide, 23 feet. The foundation was formed by driving 12 inch iron shod oak piles about 10 feet into the disintegrated gneiss rock which underlies the locality. To the top of the piles are fastened 12 inch timbers running across the width, and on these is laid the floor of 3 inch plank. To form the sloping sides, piles were driven perpendicularly, in rows corresponding to those in the bottom, and cut off to a line conforming to the proper inclination. On the top of the piles were secured timbers running longitudinally, and to these were framed and fastened other timbers running down the slope, and fastened at the foot to the bottom timbers. To these sloping timbers were fastened the planking of the sides, so placed as to form steps of about eight inches rise and the same tread. Several rows of sheet piling were driven across under the dock to prevent the water from the river finding its way underneath, and tending to float it. The gate is an iron boat of sufficient length and depth to fill the gateway. The keel, stem and stern post project evenly about six inches, and are made to fit in grooves in the bottom and sides of the gateway. These grooves are lined on their inner sides with rubber, so that when the pressure comes against the gate a water-tight joint is formed. The gate has tanks to be filled with water to sink it to its position, and is provided with pumps to exhaust them, and also valves

to admit water to the dock when it is to be filled. The dock is now in daily use and will prove to be a great advantage to the shipping interests of the city.

American Paper Car Wheels.

A correspondent of the *Railway World*, writing from Philadelphia, has obtained several interesting facts about paper car wheels. These wheels have been in use long enough to make a very remarkable record, but the very idea is a novel one to most people. The display of the company is found at Column E 65, associated with those of the numerous other car wheel companies, which together constitute the finest display of car wheels ever brought together. Specimens of paper wheels 30, 33 and 43 inches in diameter are shown, and one with a section cut out so as to show the interior structure. The wheel has a tire of steel with inside flange and cast iron hub. Cast iron or steel plates, 3-16ths of an inch thick, are bolted to each side of tire and hub, and the space between is filled with a homogeneous solid mass of compressed paper. The weight is transmitted from the hub to the tire solely through this elastic center. This is secured by leaving a small annular space between the circumference of the side plates and the inner side of the tire, and by elongating the bolt holes through the web of the tire. In case of fracture of the tire an inside flange holds it to the body of the wheel.

The paper is made of straw boards $\frac{1}{8}$ inch thick, pasted together with rye flour paste, and made into sections $\frac{1}{4}$ inch thick. They are then subjected to a 400 ton pressure for about five hours and then dried with hot air. These sections are then pasted together to the requisite thickness of about $3\frac{1}{2}$ inches, and again pressed and dried, forming a disk, which is turned off, and the tire is then forced on with a pressure of about 150 tons.

The writer says in conclusion: "It is claimed for these wheels that they are absolutely safe. The paper does not disintegrate like iron or steel; the bolts do not loosen as in wood, and the whole mode of construction and the materials used, render any dangerous breakage well-nigh impossible. These wheels are very elastic, cushioning blows and being easy upon rolling stock and track. They are economical. Some are in use which have run 386,400 miles with only slight wear of tire. One, which is in good condition, although it has run 312,900 miles under a Pullman car without the tire being turned, is exhibited."

We have a word to say in regard to these claims, which the correspondent does not seem inclined to fully endorse. So far as anything in the mechanical line can be, these wheels are absolutely safe, for if the tire bursts the wheel has a solid tread with two flanges on each side to hold it in place. The other points we fully endorse, having carefully watched the progress of the invention since the time when the first wheels were put under a car on the Vermont Central. Their record has been admirable. The tire has a much longer life than on a solid or uncushioned wheel, hence such enormous mileages as those mentioned above, made, too, without turning off. In a conversation with Mr. Pullman, some months since, he expressed the greatest satisfaction in their working. For heavy cars a cushioned wheel has become a necessity. These wheels are made by the American Paper Car Wheel Manufacturing Company, Hudson, N. Y., and are having a considerable sale in Europe. For large wheels such as are commonly used abroad, say from 40 to 43 inches, the paper wheel is admirably adapted.

Physiological Effect on Condensed Air.—The Engineer says: M. Bert, of Milan, has for a long time been conducting a series of experiments with a view of determining what are the physiological effects of condensed air on the human system. Many engineering works of the day involve the necessity of workmen carrying on their operations under various pressures of air, to say nothing of the fact that the rise and fall of the barometer involve us all in changes differing only in degree from that which the diver experiences when he descends from the surface of the water to a depth of fifteen or twenty fathoms beneath it. M. Bert thinks that the influences of ordinary changes of air as indicated by the barometer are due exclusively to the varying quantities of oxygen contained in the air inhaled. The pressure of oxygen and the consequent amount of it which finds its way into the blood, he shows, depends upon the centesimal proportion of it in the air and upon the barometrical pressure; and he says that the mischief which operates in air-tight dresses so often experience from the density of the air they are compelled to breathe might be completely obviated if an atmosphere were composed of air and nitrogen nicely adjusted in proportion to the pressure under which the mixture was passed along the tubes. Although it has been stated on good authority that a man may follow avocations involving the breathing of condensed air in certain cases not only without injury but even with advantage, there are also many cases in which injury is believed to result, and M. Bert's experiments may prove to be of great benefit to them.

Monster Armstrong for Italy.—The 100 ton gun manufactured by Sir William Armstrong for the Italian government will be proved at Spezzia. Instead of being fired from a sleigh or carriage, it will be mounted on a pontoon raft and fired afloat. Sir William Armstrong has guaranteed that the gun shall yield an energy of 25,000 foot tons, which, with the 2000 lb. shot which is to be employed, will necessitate a velocity of only 1343 feet per second. The 81 ton gun has with a lighter projectile accomplished a velocity nearly equal to 27,000 foot tons, and if the 100 ton gun is prepared to endure corresponding charges and equivalent pressures, it should give results in increased proportion.

Trial of the Improved Lightning Saw.

The EMPEROR, DOM PEDRO, accompanied by Director-General Goshorn, Superintendent Aiken, and Mr. Moore, of the Machinery Hall, at the Centennial, on the evening of June 29th. Among other things inspected, at the invitation of E. M. Boynton, of New York, they witnessed a trial of the new Lightning Saw. At 9 P.M. on the 29th, two men with one of these saws cut off a sound log of gum wood, one foot extreme diameter, in seven seconds, or at the rate of a cord of wood in five minutes. Messrs. Corlies, Morell, Lynch and other members of the commission witnessed the trial and timed the cutting. The Emperor remarked that was fast, very fast cutting. Last evening the Emperor made another examination of the saw.—*Philadelphia Press*, June 30.

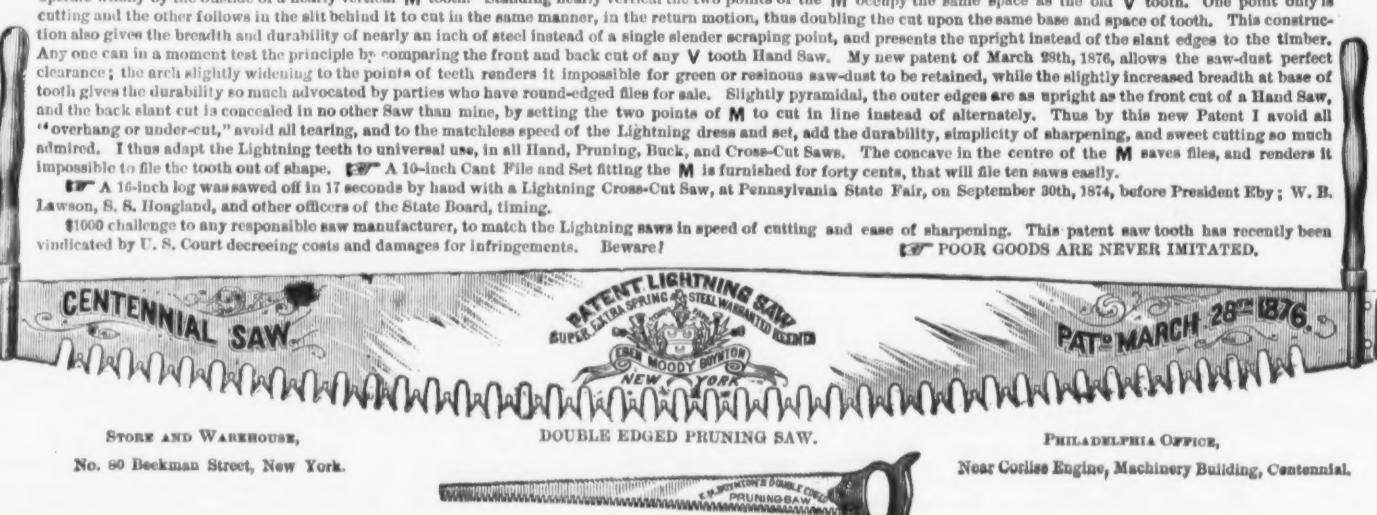
Boynton's Saws were

effectually tested before the Judges at the Philadelphia Fair, July 6th and 7th. An ash log, 12 inches in diameter, was sawed off, with a four- and a half foot Lightning cross saw, by two men, in precisely six seconds, as timed by the chairman of the Centennial Judges of class 15. The speed is unprecedented, and would cut a cord of wood in four minutes. The Representatives of Russia, Austria, France, Italy, Spain, Belgium, Sweden, England, and several other countries were present, and expressed their high appreciation.

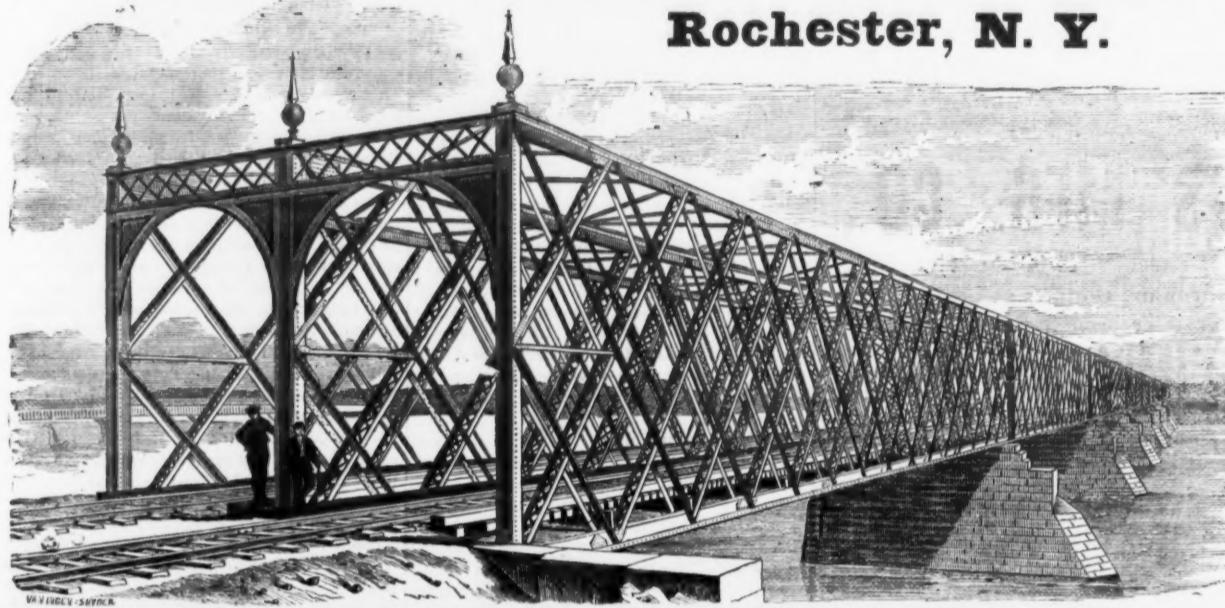
■ A 16-inch log was sawed off in 17 seconds by hand with a Lightning Cross-Cut Saw, at Pennsylvania State Fair, on September 30th, 1874, before President Eby; W. B. Lawson, S. S. Hoagland, and other officers of the State Board, timing.

\$1000 challenge to any responsible saw manufacturer, to match the Lightning saws in speed of cutting and ease of sharpening. This patent saw tooth has recently been vindicated by U. S. Court decreeing costs and damages for infringements. Beware!

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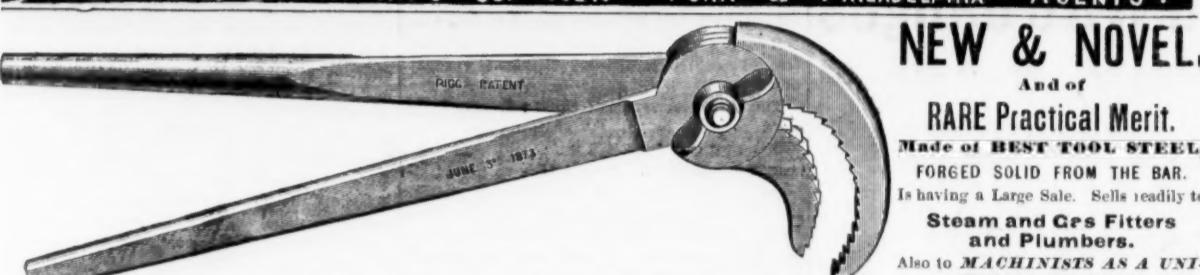
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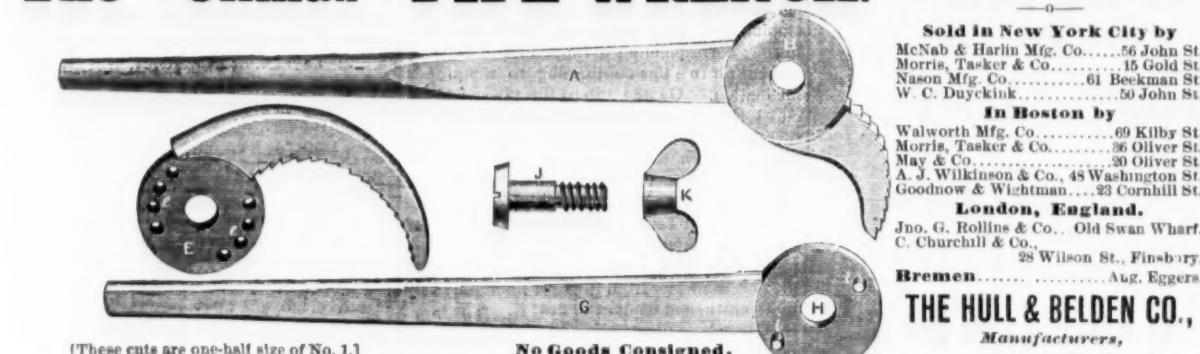
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[Accompanying engraving represents the Springfield Bridge, built by the Leighton Bridge and Iron Works.]

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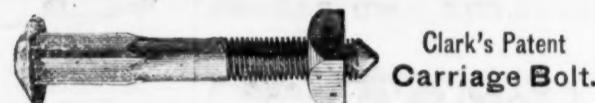
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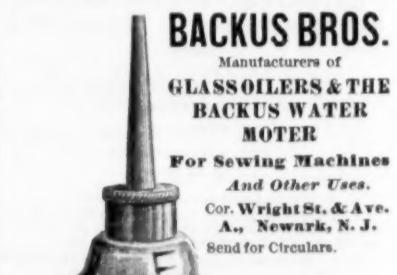
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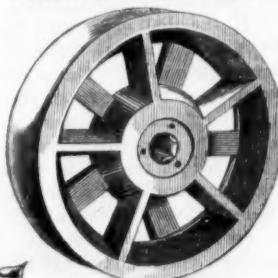
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The Iron Age.

New York, Thursday, September 21, 1876.

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Germany.....	6.08	3.04	1.52
Italy.....	16	4.08	2.04
Peru.....	8.16	4.08	2.04
Bolivia.....	6.08	3.04	1.52
Mexico.....	8.16	4.08	2.04
Chile.....	8.16	4.08	2.04
New Zealand.....	5.04	2.52	1.25
Brazil.....	8.16	4.08	2.04
Total.....		555,762	623,942

Showing an increase of 68,280 gross tons. The shipments are already within less than 300,000 tons of what they were during the whole season of 1875. If this percentage of increase is continued through the year, the amount shipped will be over 1,000,000 tons, and unless there is a very marked improvement in the iron market a large part of this stock will have to be carried over to another year, or sold at prices below those ruling at present.

And should not ore be sold at less than the rates ruling? The way to reach a conclusion on this point is: take a fair estimate of the cost of mining and transportation to Cleveland, and see if ore cannot be afforded at a profit at even less figures than the present rates. Of course it is not right to take the very lowest cost of mining, nor is it fair to take the highest, and the transportation rates should be those at which ore can be carried. If mines have made contracts at excessive figures, and lower ones can be obtained, the consumer should not pay all of the expense of their want of wisdom. Just what the cost of mining is, cannot, of course, be definitely ascertained. Maj. Brooks puts it at \$2.64 in his geological report. Since this estimate was made many items of cost have been largely reduced, but, on the other hand, some have been largely increased, but we think that \$2.64 per ton would be a fair estimate of the present cost of mining, including delivery on the cars at the mine. One mine, and among the largest, did this work for just one dollar less than this last year, while it cost another, by reason of extra work, \$3.20 per ton.

We have more definite information as to freights. We have seen letters offering to make contracts for the season for carrying ore from Escanaba to Cleveland at \$1 per ton. The Cleveland *Leader* of June 6th, speaking on this subject, says:

An item is going the rounds of the newspapers concerning the extent of the ore trade at the present season, and the prices paid on charters made from Marquette and Escanaba to Lake Erie ports. The figures mentioned on new charters are \$1.50 and \$1.40 from Marquette, and from Escanaba \$1.25. From the former port they are quite correct, but from the latter port, Escanaba, instead of \$1.25, the prices paid have been about 90c., except in the early part of the season, when one charter of 30,000 tons was mentioned at \$1.18. Up to the present time not to exceed a dozen cargoes have been received at all the Lake Erie ports, and most of these were from Marquette, on the old contracts of three and four years ago, at prices varying from \$3 upward.

The *Inter-Ocean* of May 27th says:

All the larger vessels running here are carrying on old contracts at \$3 per ton. They have three or four more trips to make, after which they will have to come down to \$1.50 or \$1.40, or perhaps less. Freights from Escanaba to Cleveland average \$1.25. There have been but few charters made, and those were for \$1.50 from here to Cleveland and Erie, and \$1.25 Escanaba to same ports. Taking into consideration the fact that the larger carriers in the ore trade will soon clean up their contracts, which will not take them quite half the season, there must, if they continue in the trade, be a large amount of tonnage for charter, which will tend to keep freights where they are now, if they do not meet with a still greater reduction, without there is a decided change for the better, both in the demand and price of ore.

We go back thus far to show that the low rates ruling at present date from near the beginning of navigation.

Taking, then, the cost of mining the ore and delivering it on the cars at the mines at \$2.64, and Lake freights at \$1.25, we would have left, on \$6.50 ore, \$2.61 for profit and other charges, such as freight to Escanaba, dockage, handling, insurance, etc., which will leave a very handsome profit, and would do so if ore was 75 cents less per ton. Of course in this discussion the figures given are all for hard ore, such as the Republic, Cleveland and New York.

From what we have said our readers can draw their own conclusion. One thing is certain: if Western furnaces are to run and pig iron continues at the present low figures, they must have cheaper ore. Some of the furnaces running on mill iron are trying to meet the emergency by using cinder, but this must stop or the furnaces will be ruined. The makers of Bessemer pig have had a little margin, but if the present downward tendency of Bessemer rails continues, steel manufac-

turers cannot pay prices for pig that will justify present prices for ore, and if the amount is brought down that seems probable, it must either be sold less than present prices, or it must be carried to another year, with the prospect of even less prices than can be obtained for it now.

The Theory of Protection.

The London *Times*, of recent date, contains an article discussing the tariff policy of the United States, which differs from most of the articles on this subject which we find in the English papers, in that it manifests no ill temper and does not hold out any false hopes to the British manufacturer who longs to regain control of our markets. It is not a remarkable article in any other respect, except that it contains the first clear experience we have ever seen of what intelligent English people consider the theory of protection and its results. This portion of the article is so interesting that we quote it:

The theory of protection is that capital invested in any particular way should be secured profits which would not be secured by the wants of the customers whose wants such investment was intended to supply. The profits obtained under such a system tempt a vast quantity of capital to embark in artificial schemes of production dependent on prohibitory duties. Capital thus employed will secure excellent machinery, and after time excellent workmen, but customers will not follow as a matter of course, and this is the lesson which producers in the United States are now being taught. The favor shown to native production by the Legislature allured all the unemployed capital of the country. Manufacturers who had invested lavishly, relying on the favoring breeze which filled their sails, found themselves in ruinous competition with the owners of capital tempted into business by the profits secured by a system of protection. Everywhere there is a cry of glutted markets, and overproduction. An arbitrary policy like that of protection naturally produces such results. Capitalists see that the imposition of a duty of 20 per cent, secures certain profits. They may hope to secure a share of these profits, or that a duty of 30 per cent, may be imposed to cover their investment. As a matter of fact, with a rigorous system of protection we have a general collapse of United States manufactures. Free trade is now recognized as the commercial future of the United States, and we welcome such a conviction because this system must economize the resources of the energetic population now engaged in settling the vast territories of the American continent.

This is, no doubt, a fair statement of English opinion respecting protection as a system and its effects, but no intelligent American needs to be told that it is a mistaken one. As we understand it, the theory of protection is that the source of all wealth is production, and that a diversified production, which utilizes a great variety of our resources is, in the end, more profitable to the country than the concentration of our energies upon the production of raw materials to be exchanged for manufactures. This diversification of industry, even though stimulated by a tariff, is not attended with any disadvantages, so far as its effect upon the interests of the masses of the people is concerned, since capital by no means monopolizes the benefits of protection. Labor is trained to higher employments and enjoys a larger proportionate share of the profits of production. Even those who continue to be producers of raw materials, find a more profitable market at home than could have been found abroad, and natural resources are needed and utilized which, without protection, would have lain useless, perhaps, for generations. The result was to more than double our production of manufactured articles, to vastly increase the home consumptive demand for food and for the varied products of mine, forest and farm, which are the raw materials of our manufacturing industries, to vastly increase the wealth of the nation, and to place us to-day in a position in which we can compete with the world in nearly all departments of industry in which it is practicable for us to engage. The Centennial Exhibition shows far better than words can describe what protection has accomplished.

Naturally, this induced diversification of industry was not favorable to cheap production. The theory of protection was that we should first attain variety and abundance of production, and after that point had been gained we should have cheapness. Those who advocated this theory were not mistaken. As soon as what we call "overproduction" was reached, prices fell to a point which rendered manufacturing for export possible, and we are now rapidly extending our export trade and seeking foreign markets which, in the days of our struggle for industrial independence, were closed to us. The fact that we have passed through a long period of industrial and commercial stagnation does not contradict the theory of protection in any respect. Great Britain has found in free trade no safeguard against like misfortune at this time, and from present appearances we are likely to be in the enjoyment of a comfortable prosperity first. There is no probability of any material change in our tariff policy for some years to come, but were protection suddenly and entirely removed we think the world, and especially our

British friends, would be astonished to see how little of the "hot house growth" character our leading industries possess at this time, and how quickly and easily they would adapt themselves to the changed conditions. We think there are very few of our leading industries which would succumb to foreign competition, while many of them are in a position to "carry the war into Africa" and compete with Great Britain for foreign markets. We have passed the period of high prices, large profits and large wages, and entered a period of economy, cheapness and low wages. Home competition has prepared us for foreign competition, and the theory of protection has been fully realized in the present condition of our great manufacturing industries.

Great Engineering Works.

It is a noticeable fact that the grandest engineering schemes and those which will most seriously affect the world's commerce, are plans for new waterways, canals and like, rather than railroads. Not even the building of the Pacific Railroad has had as great an influence upon the commerce of the world as the completing of the Suez Canal, which has completely revolutionized the East Indian trade of a whole continent. The plan, talked of for years, was at last completed by the industry and pluck of a Frenchman. Now we have a revival of the Nicaragua Ship Canal project by the French. New explorations and a re-examination of plans before proposed seem to show that the work is possible at an expense not too great to be undertaken by powerful governments, though far beyond the reach of individual or corporate effort, the cost being estimated at from \$65,000,000 to \$100,000,000. In its effects it would be much more important than even the Suez Canal, and while it would revolutionize certain branches of commerce, would prove an immense benefit to this country. Another project less revolutionary in its nature, but promising immense things in the way of opening new country, is the West African Canal, by which it is proposed to unite the waters of the Senegal and Niger by making a new sea in the great African desert. This, we believe, is a French idea, and is, perhaps, one of the most important of all, as its execution may involve a change of climate over a considerable extent of country in the vicinity of the inland sea. The commerce called into existence would be very considerable and very profitable to the countries bordering the sea.

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navigation, and it may happen that in the next 50 years the despised canals will be their proper rank, and engineers again turn their attention to these means of inland water transportation.

The Tin Markets.

The course of the tin markets thus far this year has been in the highest degree unfavorable to the holding interest. Several circumstances connected with the world's supply from the extreme East seemed to promise better times, yet they have thus far gone for nothing, and the dull summer months have gradually carried back the ruling at London very nearly to the lowest previous point. We were assured from month to month that the deliveries from the London stock were on a scale liberal enough to soon reduce it to a normal figure; but instead of decreasing, the available supply in that market has assumed more unwieldy proportions than ever before. Twelve months ago £70 appeared to be price out of the question; the metal has since declined to this, however, and it recovers with extreme difficulty. Yet the deliveries have been all that could have been expected, and have even exceeded the most sanguine hopes of holders, but they have not sufficed to improve the statistical position of the market. In other words, production has been in excess of the consumption. In former years, when trade in Europe and America flourished, there was the speculative element always ready to keep out of the market temporarily a large amount, both in Holland, England and on this coast, but since speculators for a rise have withdrawn altogether from the tin trade, the metal has been left to shape its own course between the supply and the demand, and the consequence has been a decline of upward of 40 per cent, since the panic three years ago. Nor do the statistics, taken as a whole, present any very encouraging features, as will be seen from the following items:

STOCK OF TIN IN EUROPE.				
Jan. 31.	Aug. 1.	Aug. 1.	Aug. 1.	Aug. 1.
1876.	1876.	1875.	1875.	1874.
Tons.	Tons.	Tons.	Tons.	Tons.
Banca on warrants...	1,113	1,940	997	910
Banca Trading Company...	1,658	1,364	2,403	8,825
Billiton...	875	937	858	890
Straits and Australia at London...	6,038	7,147	5,566	2,401
Total.....	9,684	10,688	9,726	8,026

AMOUNT OF TIN AFLOAT FOR EUROPE.				
Jan. 31.	Aug. 1.	Aug. 1.	Aug. 1.	Aug. 1.
1876.	1876.	1875.	1875.	1874.
Tons.	Tons.	Tons.	Tons.	Tons.
Banca...	491	243	1,114	800
Billiton...	1,000	800	1,000	480
Straits...	923	960	1,040	730
Australian...	2,403	1,300	1,393	1,020
Total.....	4,756	3,303	4,547	3,090

The visible supply on August 1, last, was 18,891 tons, against 14,440 at the end of January, 14,273 a year ago, and 11,056 two years ago. It will be observed, however, that the Netherlands Trading Company has worked off its own stock of Banca very successfully, and has but little afloat. This is neutralized, however, by the steady swelling of the London stock, which reached 7730 tons on the 1st instant, as the telegraph has since informed us. The total visible supply on the 1st instant had increased to 15,508 tons. On the other hand, the quantity on the way from Australia on August 1 was but half the amount afloat February 1st, and the total expected from all quarters on August 1 had been much reduced.

We are, moreover, informed by cable that both the Straits and Australia are at present shipping much less to England than for a long time past, chiefly on account of the low price at London. Experience has taught us, however, that during the last quarter of each year quite a revival usually takes place in tin shipments from Australia, and we see nothing to prevent its repetition this season. Steadier silver and exchanges in the Straits will set them going again. Unless it happens that the deliveries to *bona fide* consumption in Europe assume proportions not now probable, or that speculation over there takes hold of the metal, we cannot see from whence much of an improvement can be expected.

Last month the deliveries in England and Holland were 1867 tons, against 1537, 1909 and 1157 in July, 1876, 1875 and 1874, and 2481 in June this year. They were fair, but nothing extraordinary. In London alone they had been during the 12 months ended August 31, 1876, 12,582 tons, against 9087 tons the first eight months of 1876, and 8101 the first eight months of 1875, yet in spite of this the stocks there are more ample than ever. The conclusion to be arrived at from these figures is that consumption has been unable to cope with a superabundant supply, and that the ruling rate for tin represents its true value, that it is not inordinarily depressed, though apparently very cheap, and that the price it commands in the markets of the world conforms pretty closely to its intrinsic value. If the latter were not the case, production in the Straits settlements

and Australia would of necessity be curtailed, and the article would gradually rise without an effort; but we can perceive no diminished output as yet, and, until we see it, we can discern no sure sign of a lasting improvement.

How moderate the visible supply has been in former years the following monthly averages will show:

AVERAGE MONTHLY VISIBLE SUPPLY IN ENGLAND AND HOLLAND.

	Tons.
April 1, 1866, to April 1, 1867	12,218
1867, to " 1868	11,271
" 1868, to " 1869	9,407
" 1869, to " 1870	8,563
" 1870, to " 1871	8,347
" 1871, to " 1872	7,034
" 1872, to " 1873	6,565
" 1873, to " 1874	9,136
" 1874, to " 1875	11,341
" 1875, to " 1876	13,619
Average, 9,750 tons.	

We are quite ready to admit that the American market is in a more favorable position than that of Europe, in view of the diminished supplies expected from Singapore, coupled with a moderate stock here, but any considerable enhancement in price would soon stimulate larger shipments this way from England.

The Storm and the Water Famine.

On Sunday of the present week a storm of remarkable violence visited the city of New York. The damage done by it was very considerable, although this city suffered much less than many others. In spite of its fury and the destruction it caused, its visit may be looked upon as a blessing, for it virtually put an end to New York's water famine. For more than two weeks the supply of Croton has been seriously diminished by order of the engineers in charge. Up to this time the consumption of water has been steadily on the increase for years, and during the present season reached the enormous figure of 105 gallons per inhabitant for 24 hours. Warnings and expostulations were alike in vain, and, as a last resource, the supply was reduced. Never before has there been any such drain upon the resources of our aqueduct and reservoirs as during the present, and never before, if we are correctly informed, have we had such a limited rainfall at the critical portion of the season. The water, unfortunately, has been wasted, and not used. The supply is abundant—large enough, in fact, for a city of the size of London, whose population is three times that of Manhattan Island, and, although with our climate we need more water than is necessary in England, yet more than a hundred gallons per day per head of population is excessive.

Waste goes on in all directions, apparently without the least effort on the part of the individual to prevent it. In saloons, hotels, factories, stores, and along the wharves, the quantity of water that runs to waste absolutely without purpose is distressing. If this were paid for it would be some consolation, but it is not. The very fact that Croton costs but a nominal sum seems to stimulate every one to waste just as much of it as is possible with the means at hand. Even in houses and offices it is no unusual thing to find a faucet running a steady stream night and day. The size of the stream is small, and it seems so insignificant that people do not think the matter worth attention. A stream of water no larger than a lead pencil, and running silently, will easily flow at the rate of 700 gallons in 24 hours. With a head of water equal to thirty feet, we have seen an ordinary basin cock deliver water at the rate of a gallon in three-quarters of a minute, or considerably more than 1400 gallons per day, a quantity of water more than sufficient for a family of twenty persons using all they would need for a day. Practically 60 gallons per day is more than an individual can use, except under extraordinary circumstances. The individual does not generally use a tithe of this personally; the quantity is only arrived at by averaging from the consumption of a family or a number of people. In the country, where the water for household use is taken from a well or cistern, the amount consumed per individual is probably very much less than this, and we think, from rough calculations that we have made, that the average consumption of water for a week by a family of three persons in a country town is about 11 gallons per head each day. Yet we find that in this city, as well as in Brooklyn, water has been wasted at the rate of 100 gallons per head. Paterson, New Jersey, has been having a water famine as well as New York, and one which has probably caused the people not only more anxiety but more trouble also. To that city, as well as many others, the recent rain will be a great relief in filling streams and supplying the reservoirs.

The lesson to be learned from the unfortunate experiences of this city and Brooklyn is a double one. First, it is impossible with any ordinary expenditure of money to supply as much water as a large city can waste. Second,

from the beginning people must not be allowed to waste with impunity. This may entail a great innovation in the manner of serving water or selling it, but it is necessary. What costs people nothing they are prone to value lightly and waste extravagantly. While we believe in giving an abundant supply of water at the cheapest possible rate, we think that waste should be paid for, and the price charged for it should be very high.

The *Labor Tribune* has but one cause to which it ascribes all the ills to which the body politic is heir, and that is the rates of interest paid; but one aim, and that is usury laws. In commenting on our editorial of September 7th, on "Encouraging Indications of a Revival in Iron," it says: "The bolt works and Zug's resumed, because they were purchased at a depreciated price. The anthracite combination broke up, because it could not pay the high rates of interest. There would be but few commercial failures if the interest on money was low. These failures are chiefly due to paying high interest. No revival can come while the industries are subjected to such a tax. The manufacturers who suffer directly certainly know this, and they know a revival of business is impossible as long as this burden rests upon them. It is surprising that our commercial and manufacturing interests rest so quietly under the terrible load of taxation. As long as they can get the high interest out of consumers they run on, hoping for a change, which cannot come. The causes of the depression must be removed, and we ask the help of the employers of labor to bring about this end. The workingmen have made the start.

This is nonsense. If the bolt works and Zug's resumed, as it claims, only because they were purchased at a depreciated price, why has not Rogers & Burchfield's and Wharton's and Glass, Neely & Co.'s mills started up? They could all be purchased at a depreciated price, and if "purchasing at a depreciated price" is the magic wand that would set our idle mills in motion, we wonder that it has been overlooked for the past three years.

"The anthracite combination broke up because it could not pay the high rates of interest," is another lucid and overpowering statement of the reasons of this failure. Will they be in any better position to pay the interest they must pay with a cost selling at a reduction of 40 per cent?

These reasons are simply absurd. While high rates of interest may have forced many men into bankruptcy, the trouble is back of this, and is lack of capital. It is because men have placed themselves in a position where they have been compelled to pay high interest, and if instead of ranting about reducing the rates, the *Labor Tribune* would denounce those who attempt to do business without adequate capital, it would be more sensible, but this is too much to expect.

By the way, it would be interesting to know why the *Labor Tribune*, in copying our article, omitted that portion showing the cost of fuel per ton of pig and merchant iron. Is it afraid of the truth?

New Publications.

WOOD CONVERSION BY MACHINERY. By John Richards, M. E., author of "A Treatise on the Construction of Wood Working Machines," "The Operator's Handbook of Wood Working Machinery for Practical Workmen," "Workshop Manipulation." London, J. & W. Rider. 100 pages.

It is safe to say that anything that comes from the pen of Mr. Richards is not only worth reading but is also interesting. No writer upon mechanical subjects since the time of Zera Colburn has had so complete a command of English, or been so happy in his descriptions as Mr. Richards. The little volume before us is no exception to the rule, being full of desirable information—information, too, expressed in the pleasantest manner. Some of the chapter heads are as follows: Economic effect of wood working machines; inventions of Sir Samuel Bentham pertaining to wood working machinery; patents on wood working machinery; factories foundation; arrangements of factories; saws and sawing; shaping wood, &c. These were originally a series of articles contributed to the *Timber Trades Journal*, and were largely historical and economic. They are full of hints and suggestions, and are well worth the study of any manufacturer, whether of wood or metal or other material, containing as they do so much that bears not only upon the subject in hand, but upon the general principles of manufacturing.

ARTIFICIAL IVORY.—The patent taken out by B. S. Cohen, of London, thus describes the method of the manufacture of this article. Ivory dust is boiled with water to a jelly, and to this is added some shellac dissolved in alcohol, and some oxide of zinc. For every pound of ivory, 1 oz. each of shellac and zinc oxide is taken. The pulpy mass is poured into forms, allowed to become dry in the air, and then subjected to hydraulic pressure. The finished material may be cut, sawed and turned as well as natural ivory or bone.—*New Remedies*, v. 256.

HARDWARE AT THE CENTENNIAL.

Main Building.

THE YALE LOCK MANUFACTURING CO., Stamford, Conn. The exhibit of this firm is in the Main Building, P 72, and is beyond doubt one of the finest and most practical displays in the whole Exhibition. The space occupied is 30x35 feet, and a leading feature of the display consists of a model post office, the interior fittings of which are solid walnut, the exterior white pine and walnut, and the boxes of solid bronze, handsomely figured. The exhibit is intended to illustrate the company's facilities for furnishing post office equipments, and anything more complete or convenient than the one shown it would be difficult to imagine. It is supposed to be of sufficient capacity to accommodate the postal requirements of a town of 15,000 to 18,000 inhabitants, and the arrangements, for sorting letters, delivery, etc., are so admirable that two persons could easily carry on the work of the whole office. The number of lock boxes is 545; call boxes, 600; alphabetical letter and paper cases, arranged with delivery wickets, joiner work, money order room, overhead sashes, etc., etc. Each lock is different, and no key will unlock any but the one it was made for. The postmaster is provided with a master key to unlock the drawers and cupboards in the post office proper. The display is complete to the minutest detail, illustrating every department of post office work, and cannot fail to be of interest to every intelligent visitor. The company also display a magnificent assortment of house furnishing and builders hardware in real bronze, comprising door, shutter, window and closet knobs; lever and store door handles, roses and escutcheons, bell pulls and levers; fast and loose joint bolts, catches, bolts, sash fasteners and lifts; shutter bars, name plates, etc., etc. The designs of these goods, both as to form and ornamentation, are of the most beautiful character, while in the quality of the material, excellence of workmanship and elegance of finish they cannot be surpassed. They also display the same line of goods in verd-antique, antique, gilt, illuminated, nickel-plated, nickel and black, nickel and gold and enamel. They also display a great variety of locks, known under the denomination of the "Yale" and "Standard." Both are equally well finished, and give the greatest possible security. The Yale time lock, however, appears to be a special attraction to many, and, although our readers may be familiar with its general character, a brief description may not be out of place. This lock when once set requires no further care except winding, and performs unaided all of its duties automatically. It can be wound without exposing the mechanism of the lock by means of the eyelets or ports in the glass face, through which the winding key is inserted, thus removing all danger of injury to the time movements by dust and dirt. It will not lock unless both movements are running, thus making it impossible to lock with one movement only. It can be set to lock, as well as unlock, at any given hour, and the hour for locking or unlocking can be changed in a few seconds. It can be set to remain locked from Saturday night to Monday morning, or to open during the daytime of Sunday, as may be desired. It has four separate and independent devices for unlocking, either of which will unlock it. It never can run down in the locked position; for, if through any carelessness in setting the lock, or through omission to wind it properly, the dials should be permitted to stop when in the locked position, the running down of either movement will open the lock. It is thus protected against any possible carelessness or inattention on the part of the user. It cannot be tampered with by unauthorized persons, for its door is fastened by a fine key lock, and need never be opened unless it is desired to change the hours of locking or unlocking. The clock mechanism is cushioned between springs, so that no jarring or sledging of the door can affect it. It has two separate independent and jeweled chronometer movements of the best construction. It is designed to be used in connection with other locks as an additional security, and can be applied to any vault or safe door where there is a vacant space of 7/8 inches wide by 6 inches high, without making a hole through the door, or in any way changing or disturbing the other locks or bolt work. A very handsome show case contains a display of chronometers used in connection with the Yale time locks; these are made by Howard & Co., Boston, and are the perfection of fine workmanship. The company also make a splendid display of mortise, house and store door locks, dead locks, desk, drawer, chest and cupboard locks, sliding door locks, &c. These locks comprise an immense variety of styles and sizes for different purposes, yet they all embody the same essential principles of construction, the distinctive features being the formation of the parts acted upon by the key, and the shape and size of the key itself. The escutcheon or "tumbler case," containing the pins upon which the bits of the key operate, projects slightly from the case of the lock, the depth of the escutcheon regulating the length of the key, without regard to the thickness of the door. These peculiarities may be illustrated by the description of a Yale mortise night latch, the escutcheon of which is applicable to every variety of lock. The escutcheon consists of an exterior cylindrical shell, having in its lower part a smaller cylinder, above which is a metallic case containing the "pin chamber," and within these is the "plug," to the inner end of which is attached the cam that imparts motion to the bolt. In this plug is the keyhole. The escutcheon contains five holes or pin chambers, formed partly on the shell and partly in the plug. If the pins filled these holes the rotation of the plug would be prevented, but being cut in two it revolves freely, carrying with it the lower half of the

pins, and leaving the upper half in the shell. The upper part of the pin is called the "driver," the lower half the "pin," and above each driver is a spring which presses constantly downward. In this position the drivers intersect the joint between the shell and the plug, completely preventing the rotation of the latter. If, by the insertion of any slender instrument, the pins are raised to their utmost height, they will bar the movement of the plug as effectually as the drivers did, or if four of them were properly elevated the fifth would still hold the plug in check. To open the lock, therefore, all the pins must be raised simultaneously to just the proper height, which can be done only by the right key; a variation even of one-fiftieth part of an inch of the length of one pin will prevent the opening of the lock. This explains the immense variety of keys and almost limitless range of permutations of which the Yale locks are capable, and constitutes an element of security in greater degree than is possessed by any other locks now made. The width of the key permits ten different "bittings," or depth of notches, therefore a lock with but one pin could be variously "set up" so as to require ten different keys. With two pins the number of possible changes would be 100; three pins, 1000; four pins, 10,000; five pins, 100,000; six pins, 1,000,000, and seven pins, 10,000,000. The least number of pins in any of the Yale locks is four, as in drawer and desk locks; night latches have five; post office, store door locks, &c., six; safe-deposit locks, seven. All descriptions of keys are made from the best quality of English cold rolled steel, and are heavily nickel-plated. A careful record of all permutations is preserved in order to avoid the duplication of keys. Owing to their peculiar construction, it is claimed that the Yale locks admit of a wider application of master or "pass" keys than any other locks ever made. With two exceptions, any or all of the Yale pin locks may be arranged in one set, controlled either by the same key or a master key, hence a number of locks may each have its own special key, while a single master key will open them all. The Yale prison locks are also a prominent feature of the exhibit, and appear to entirely meet the purpose for which they are designed. It is not attached to the door, but built into the masonry of the cell wall, and is perfectly inaccessible from within the cell, the bolt projecting into the door jamb. The arrangement is such that the door may be swung to and fro, and afterward dead locked by slightly turning the key. This lock has six pins, capable of many thousands of changes. The Yale rim cell locks are used upon cell and corridor doors, or where it is not possible to apply the jamb lock. They are made in several sizes and styles, to open from one or both sides, have very heavy iron cases and bronze bolts, and are constructed with a view to great strength and complete security. The Yale Lock Manufacturing Company have not only made their exhibit complete and practical, but have placed it in charge of a thoroughly competent agent, Mr. Suverkop, who is posted in all the details of the business, and conversant with most of the European languages, thus enabling the company to avail themselves of every advantage offered by the influx of foreign visitors. This is a matter of the utmost importance, and one which, we regret to say, has been a serious omission on the part of many exhibitors. Such an opportunity as the present may not occur again in a lifetime, and it is poor economy to make a splendid display of goods and then leave them without some competent person in charge to explain their uses, advantages, values, etc.

The Seaboard Pipe Line.

Active operations in connection with this enterprise have been steadily continued. On August 31 a party engaged in surveying the route arrived at Columbia, Pa., in the prosecution of their labors, and continued the survey toward Lancaster, Pa.

The *Columbia Spy*, of September 2, states, probably on the authority of these engineers, that "the route of the pipe lines is from Brady's Bend, on the Allegheny River, across the Allegheny Mountains and over South Mountain to Gettysburg. The latter place is the distributing point through two main branches to Baltimore and Philadelphia. The Baltimore route has been surveyed, and the surveying parties are now working on the Philadelphia route."

The *Railway World* remarks that "Baltimore parties interested in the enterprise expressed the opinion last week that the work of laying pipe would be commenced on the 31st ult., and that the line could be completed in 90 days if no legal obstacles were interposed. There is great virtue in an 'if,' however, and the interests affected by the seaboard pipe line are so numerous and varied that the new company will probably be required to prove its possession of a very clear claim to the right of way before it can put its line in working order."

The *Catasauqua Dispatch* gives the following details in regard to the line of the pipe: "The organization of the company recently perfected shows that nearly all the pipe companies in the oil regions are amalgamating and co-operating in this enterprise, under the charter of the Pennsylvania Transportation Company. This company have a charter paramount to all others, and of much superior scope to the Free Pipe Bill. In fact, the Pennsylvania Transportation Company are empowered and have the exclusive right to lay a pipe anywhere within the limits of the Commonwealth. The company have also secured a charter from the State of Maryland equally broad in its privileges with the franchises they enjoy in this State. The pipe lines represented in the new organization, or the reorganization of the Pennsylvania Pipe Company, are the Grant, Karus, Keystone, Antwerp and Oil City Relief, and Atlantic. The following are the officers elect: President, Henry Harley; vice president, J. T. Jones;

treasurer, C. W. Bachelor; secretary, Wm. H. Abbott; chief engineer, Herman Haupt; general superintendent, Wm. Warmcaste. The project seems to meet with great favor from the producers, as promising to cheapen the cost of transportation of this great staple."

As to the location the engineer, Mr. Haupt, says: "I propose a line ascending rapidly from the Allegheny River and following the table lands along the water-sheds of the country, passing about twelve miles north of Indiana and striking the Ebensburg branch of the Pennsylvania Railroad at Bradley's Station; thence to Cresson, along the pike in close proximity to the railroad; from Cresson, an air line of fourteen miles will strike the intersection of the Hollidaysburg Branch at Brook's Mills; thence following the general direction of the railroad. The next sixteen miles to Great Aughwick Valley will be near railroads, and from this point to Newville, thirty miles, will be over a broken country, requiring the construction of roads for distribution. The total cost of 300 miles of four inch pipe, with the expense of hauling, cutting woods, laying and ditching, etc., is estimated at \$1,250,000. The cost of transporting 1,500,000 barrels of oil from Brady's Bend to Philadelphia by a pipe line has been estimated at \$250,000, which is 16 2/3 cents per barrel, while the minimum cost of carrying oil by rail the same distance (395 miles) is 39 1/2 cents per barrel."

The *Dispatch* says that "the Newville, mentioned above, is one of the objective points, but the engineer having the work in charge will, in all probability, change the route somewhat. The most direct route appears to be through the gap in the North Mountain at Roxbury, from thence to Shippensburg; thence southeast along the line of the old Baltimore Road, over the South Mountain to Gettysburg, when the line will diverge to Philadelphia and Baltimore."

The pressure at the pump is to be 900 pounds to the square inch; there are to be stations at distances of 15 miles, at each of which an engine of a hundred horse-power will be erected to work a pump to continue the flow from point to point. The engineer in chief is Harman Haupt, of Hoosac Tunnel fame, and who, during the war, was chief of the Bureau of Military Railroads.

The *Boston Traveler*, commenting upon the scheme says: "In view of the enormous product of oil in this country—30,000 barrels per day—and the rank it now holds among the leading articles of export, coupled with the exorbitant charges for railroad carriage from the wells to the seaboard, by the completion of the enterprise and its successful operation a complete revolution will be accomplished in the handling of this article."

The feasibility of this enterprise, so far as the passage of the oil through the pipes is concerned, has been fully established by the present system in operation in the oil regions, where the aggregate length of the pipes conveying the oil from the several wells to the reservoirs is nearly 250 miles.

Shipbuilding on the Clyde.—The *British Trade Journal* says: "The prosperity for which the Clyde shipbuilders were so long envied by their brethren in the south seems to be drawing to a close. Whereas men in Clyde yards used to work longer hours and take lower wages than those on the Thames or the Tyne, they have latterly changed to working the shortest number of hours and demanding the highest rate of wages. Orders are consequently being transferred to Belfast and elsewhere. The amount of building in progress has not as yet greatly diminished, but builders do not see their way to much new work for the winter. According to a local report from the upper district of the Clyde, only 15 vessels were launched there during the month of July. The aggregate tonnage amounted to about 15,000 tons; and of these vessels there were 10 sailing ships and 5 steamers, the steamers representing about 4500 tons of the gross tonnage. In Govan, where there are 5 of the largest shipbuilding yards on the Clyde, there were only 3 vessels launched during the month, and these were, in the aggregate, 3400 tons. At Partick and Whiteinch there were 6 launches, comprising 4700 tons, mostly for the Indian and New Zealand trade. Dumbarton has one or two yards closed, and one of the oldest builders is finishing the last two vessels for which he has orders. Greenock and Port Glasgow report 7 launches during the month, the finest being intended for the Australian trade. The other Greenock vessels are mostly coasters of small tonnage, and the whole production for the month of July on the Clyde is certainly below the average."

Vaucanson.—The *Cincinnati Trade List* says: A monument to the memory of Vaucanson, the great mathematician of the last century, has recently been erected at Grenoble, France. It is to the ingenuity of Vaucanson that the world owes the invention of the chain for communicating motion at a distance. Through the application of this principle he was enabled to construct the first spinning machine and his wonderfully clever automata. It is said that among these last marvels of mechanism was a duck which could waddle on a dry surface and swim in the water; which could quack, eat and drink, and actually digest its food by means of chemicals introduced into the stomach. Vaucanson was not a favorite with the Court of France; and when his name was proposed to the Academy of Sciences he was refused admission through the influence of his enemies among the aristocracy. Louis XV was well pleased with the action of the Academy—remarking, when the intelligence was brought to him of the defeat of Vaucanson: "We will ask him to construct for us an automaton Academician." Vaucanson's collection of machines, models, etc., formed the nucleus of the *Conseil des Arts et Mœurs et Brevets d'Invention de Paris*.

BUSINESS ITEMS.

MASSACHUSETTS.

The White River Iron Foundry, at Hingham, owned by Thomas Weston, was burned last week, with a warehouse and dressing shop adjacent. Loss, \$25,000; insurance, \$11,000.

A Taunton machine shop has contracted to furnish 40,000 spindles to a Fall River shop. This will keep them busy six months.

CONNECTICUT.

All the factories and workshops at Winsted are running except Lathrop's Cutlery Factory, and that is expected to start as soon as there is a supply of water.

The strike of the molders at Sargent's Factory, in New Haven, is assuming a serious aspect. Two men who continue at work have been violently treated by gangs of strikers.

The workmen at Parker's Screw Works, at Meriden, got their wages raised one-third because the price of screws went up.

NEW YORK.

Both of the Alcott furnaces are at present out of blast, but one will soon blow in to work off stock on hand.

One of the Poughkeepsie furnaces is in blast and the other will soon be.

The Southfield Furnace has been in for about 10 weeks, and is doing good work.

Burden is getting ready to blow in one furnace.

The Greenwood Furnace has been in blast for 5½ years, and is still in good condition.

The Cedar Point, one Crown Point and the Fort Edward furnaces are running on Bessemer pig.

PENNSYLVANIA.

The St. Charles Furnace, at Columbia, recently blown out for relining, was put in blast again last week, and is said to be working well.

One of Coleman's North Lebanon furnaces will be blown in the 1st of October, which will make two in operation.

The Shenango Furnace Co., of Middlesex, put their second furnace in blast last week.

The Altoona *Mirror* draws this sad picture of the state of affairs over there: "From day to day numbers of employees are discharged from the railroad company's shops in this city. Inquiry develops the fact that in some departments there is scarcely any work at all on hand, while in others there is barely enough to employ the hands. While there is thus a daily increase in the number of idle ones, there is no preparation making for the care and help of the poor during the winter."

The glass house of Mr. G. W. Wells, Brownsville, is in operation again, making better glass than ever.

The rolling mill of Jacobs & Jackson, Brownsville, is working day and night. They make all kinds of bar, pipe iron and light T rails.

The Shenango Furnace No. 1, Middlesex, blew in on the 9th, at about midnight, and is doing as well as could be expected. No. 2 is not doing much; the gas flues in the stack fell in and caused a good deal of delay, keeping the blast off eight or ten hours, and giving a great deal of trouble generally. These furnaces are of the small order, built before furnacing had become a science. One of them is a 10 ft. 8 in. bosh, and the other is 19 ft. 6 in. bosh; the lining is of Barnes' brick, and the crucibles Mount Savage 9 in. brick. They were out something like two years, and that accounts, to some extent, for the trouble with the flues, etc. The blowing cylinders are of 72 inches each, and are clumsy affairs—too much machinery in motion to do the required work. There is another engine attached to the works, a vertical one, made at the Globe Works, Cleveland. The whole works look neat and tidy.

Baird & Huston, of Philadelphia, have just closed a contract to supply the Westcott Printing Company with about \$1,000,000 worth of machinery.

The Crane Iron Company, on Thursday of last week, completed blowing out No. 5 furnace, and at present there is no likelihood of another being lighted. But two furnaces are now in blast, Nos. 2 and 6.

PITTSBURGH AND VICINITY.

The purchase money from the sale of the Pittsburgh Bolt Works, sold by the sheriff about 10 days ago, less bills for taxes, costs, etc., netting \$83,879, has been paid over to the creditors. The whole amount was \$100,055.

The sales of pig iron and iron ore for the past week show a very gratifying increase. Of pig iron the sales amounted to 3005 tons, and ore to 3025 tons.

Messrs. Lindsay & McCutcheon have resumed work in the boiling department of the mill which was lately burned.

Kier Bros. have lately added a third calcining kiln at their Salina Fire Brick Works, having a capacity of 50,000 bricks. This makes their total capacity at these works 150,000 bricks.

The Danks furnaces at Graff, Bennett & Co.'s, are in most successful operation. Each furnace yields about 5300 lbs. in 6 heats, the charge being 900 lbs.

Mr. J. C. Bidwell, of the Pittsburgh Plow and Crucible Steel Casting Works, has purchased the patterns and good will of the Crucible Steel Casting Company.

Messrs. Mackintosh, Hemphill & Co. are hard at work on the pair of blast engines for the furnace of the Southern States Coal and Iron Company, at New Pittsburgh.

Porter, Bell & Co. are building a small engine for the Pennsylvania Steel Company, Harrisburg. It is only 6x10 cylinder.

The window glass factories may now be said to have been closed, owing to another lock-out occasioned by a refusal of the "gathering" boys and "tenders" to accept a reduction from last year's rate of wages. The Western Window Glass Manufacturers' Association, at its late meeting in Chicago, resolved to make a reduction of 10 per cent. in the wages of these employes, and announced that at that rate the dif-

ferent factories would start in on next Monday. The boys, although receiving 20 per cent. higher rates than were paid in the East, resolved not to accept the reduction, and notified the employers of their intention last Thursday. Only three houses were in full blast, Esteps, Chambers and Ihmsen's on the South Side, and the bars in these furnaces were pulled Friday. It is said that these tenders make from \$20 to \$30 per week.

WEST VIRGINIA.

The nail factory at the Belmont Mill, Wheeling, will be idle this week.

OHIO.

The Zanesville Furnace is being cleaned out, preparatory to relining. It will not go in for three or four months.

Cartwright, McCurdy & Co., and the Youngstown Rolling Mill Co., are largely engaged in manufacturing cotton tie for the Southern trade.

The Sheridan Coal Works are now erecting two Belgian ovens for the manufacture of coke.

An analysis of coke made of Sheridan (No. 6) coal has resulted as follows:

Carbon..... 87.845
Moisture..... 1.716
Ash..... 8.085

Per cent. of sulphur..... 1.316
Per cent. of phosphorus..... 0.0026

Character of coke, hard and bright.

Prof. Dwight further says: "This is a good coke for blast furnace use or any other purpose. The tendency of the sulphur is to make a red-short iron, just the thing for nail manufacturers." The coke in question was burned 72 hours. With the new Belgian ovens it will be burned only 48 hours, this producing more carbon and less sulphur. We hope to soon be able to record the establishment of this branch of manufacture at Sheridan on a large and remunerative scale. Lawrence county can furnish coal for all this valley and coke too.—*Ironton Commercial*.

shops in Chicago. Agents of the company are looking for a suitable site.

INDIANA.

James B. Wilks, late puddling boss of the Westerman Iron Company, Sharon, is to take charge of the rail mill at Evansville.

TENNESSEE.

The new mill of Messrs. Scofield & Co. will raise steam this week for the first time, to see if all things are in trim. They will be ready for operations in about 10 days.—*Chattanooga Commercial*, 12th.

Sheridan (O.) Coke.—Considerable attention is now being paid to the Sheridan coke.

The company finding that they can do a good thing by pushing the manufacture have ordered the building of a couple of Belgian ovens, capable of turning out about 150 bushels of coke every 48 hours. These will be done in about two weeks. We have seen an analysis of this coke by Prof. Charles E. Dwight, of Wheeling, who gives its constituents as follows:

Carbon..... 87.845
Moisture..... 1.716
Ash..... 8.085

100.000
" " phosphorus..... 0.0026

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Special Notices.

ASSIGNEE'S SALE

of
HARDWARE, CUTLERY and GUNS.
BISELL, WELLES & MILLET,
Auctioneers,

Will sell at Auction on Friday and Saturday, Sept. 29th and 30th, at 10th a. m., by order of ISAIAH METER, Esq., Assignee, the entire stock of

Hardware, Cutlery & Guns

of
MESSRS. MEYER & KASTER,
at No. 129 Duane Street, New York.

This stock is valued at over \$25,000, and comprises a large line of Table Cutlery, Eng. and Wostenholm's Pocket Cutlery, Wade, Butcher's, Rodgers' and Wostenholm's Razors, large stock of fine Scissors, Butcher and Bowie Knives.

Also Powder Flasks, Gun Material, Pistols, 500 Double Shot and Breach Loading Guns.

Also American and English Shelf Hardware, Padlocks, German Halter and Coil Chain, Hand, Panel and Back Saws, &c., &c. Also Samples, Decks, Show Cases, &c.

This sale will be worthy the attention of the trade. Catalogues ready morning of sale. Terms of sale, cash.

BISELL, WELLES & MILLET, Auctioneers,

15 Murray Street, N. Y.

AUSTRALIA.

GENCIES.—B. O. HOLZMANN, of B. O. H. & Co., Sydney, Australia, will undertake Agency on reasonable terms for the Australian colonies, Undeniable references. Communications up to October 12 may be addressed to him at the *Ashland House*, 4th Avenue and 24th Street, New York; or up to October 5 to Mr. *Wilmot*, 835 Broad Street, Philadelphia.

WANTED by a practical pattern maker with a family, situation where general work is done, on railroad or manufacturing shop. Steady place preferred. Address,

DANVILLE NOVELTY FOUNDRY, Danville, Ills.

The "Common Sense" Hay Cutters,

"VICTOR" CORN SHELLERS, and "PRIZE" CHURN are the best.

A. B. COHU, Manufacturer,

197 Water St., one door from Fulton, New York.

"Everything for the Farm," containing illustrations of most improved implements for Farm, sent on receipt of 10c.

NOTICE.

Water Filters.

BATTERSEA, LONDON, July 1, 1876.

We beg to advise the trade and public that we have appointed Mr. H. R. MENSING, 62 Water St., N. Y., sole agent for the sale of our well known

SILICATED CARBON WATER FILTERS.

SILICATED CARBON FILTER COMPANY.

1000 Double Thread Lock Stitch "Bartram" Sewing Machines, elegantly finished, easy and quick working, *satellite*, will be sold very low for cash. Inspection solicited.

THE HULL & BELDEN CO., Danbury, Ct.

We need the room which these occupy, and will sell them *exceedingly* low, if they can be removed before Oct. 1st.

It is reported that the Goodrich Mine is soon to be started up again. The same is said of the Howell-Hopcock.

The Washington Mine has been leased by Messrs. Longstroth, Maas and Mitchell, of New Haven, for a term of 20 years. The work of cleaning up and getting machinery in running order will be commenced at once, and every thing got in readiness for resuming mining operations at an early day. This property has been lying idle for some time. Forty men are at present employed at the Shenango Mine, but this force will be increased as the work progresses. The first shipment, consisting of 20 cars, was made the beginning of the week.

The Lake Superior Iron Company have discovered a fine vein of ore in the Brat pit. The new skip was put in motion on Saturday last, and quite a number of tons have already been raised.

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D. G. AMBLER, Utica, N. Y.

E. HAMILTON HUNT,
Hardware Commission,
69 LAKE ST., CHICAGO.

Consignments solicited. Best of references in New York and Chicago.

SPECIAL NOTICE

A new style of

MEN'S SINGLE GUNS,

In addition to the former line of A. Simon's, Liege,

now offered.

SILESIAN SHEET ZINC,

Imported by

LOUIS WINDMULLER & ROELKER,
20 Rodeo Street, N. Y.

Specialties of Wrought, Cast, or Sheet

Iron or Brass,

Made to order in a SUPERIOR MANNER, AT LOW

PRICES, of the

CORRUGATED METAL CO., East Berlin, Conn.

ILLINOIS.

The United States Rolling Stock Company

intend to erect extensive car and rolling stock

shops in Chicago. Agents of the company are looking for a suitable site.

INDIANA.

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charge of the rail mill at Evansville.

TENNESSEE.

The new mill of Messrs. Scofield & Co. will

raise steam this week for the first time, to see

Trade Report.

Office of THE IRON AGE.

WEDNESDAY EVENING, Sept. 20, 1876.

During the past week there has been some activity in the financial markets, and with the exception of coal stocks the prices of securities have advanced. There are no indications of a recovery in coal stocks, and the condition of the roads depending mainly upon coal traffic is certainly very far from encouraging to those who hold these stocks and bonds as securities. The D. L. & W. has published a statement of its financial condition, which makes a somewhat showing than was expected. The money market has been easy. Borrowers on call have been abundantly supplied at 1 1/2 @ 2 1/2 per cent. The quoted rate of discount on commercial paper is 4 @ 6 per cent. More is offering than for some time past, owing to the increased activity in general trade, and the large demand for currency for legitimate business purposes.

The gold market has been steady, and without feature of general interest. The following shows the daily range of the premium since the date of our last issue:

	Highest.	Lowest.
Thursday.	110 1/2	110
Friday.	110 1/2	110
Saturday.	110 1/2	110 1/2
Monday.	110	109 1/2
Tuesday.	110	109 1/2
Wednesday.	110 1/2	110

Government bonds have been steady and strong. The banks are applying for large amounts of the new 4 1/2 per cent., and the Syndicate make encouraging reports of the progress of their negotiation. State bonds remain steady and dull. Railway mortgages generally are strong, but those of the coal roads are weak, and have fluctuated considerably during the past few days. We give below the closing quotations of governments.

The stock market has been in the main strong, and there has been some speculative activity. Coal shares were depressed and neglected, and New York Central was the object of a well organized "bear" movement. The principal dealings have been in Lake Shore, D. L. & W., N. J. Central, Western Union, Michigan Central, Pacific Mail and Erie. We give below the quotations of active shares at the close of business to-day.

The bank statement shows a gain of \$1,319,900 in total reserve, and of \$537,750 in surplus reserve, the latter now standing at \$23,077,775. A good feature is the expansion of \$2,199,400 in loans, which shows that the improvement in general trade is more fully employing bank facilities. The following is a comparison of the bank averages for the past two weeks:

Sept. 9.	Sept. 16.	Differences.
Loans... \$20,451,100	\$20,639,500	\$1,188,400
Specie... 22,728,400	22,404,200	-\$324,200
Legal tend. \$37,599,000	59,223,100	Inc. 1,694,100
Deposits... 231,069,500	234,193,100	Inc. 3,128,600
Circulation. 14,371,900	14,459,000	Inc. 63,800

The foreign trade movements for the week are shown by following tables:

IMPORTS.

For the week ended Sept. 16.

	1874.	1875.	1876.
Total for week... \$6,669,952	\$5,762,468	\$5,001,875	

Prev. reported. 283,767,563 245,867,919 204,003,602

Since Jan. 1... \$95,437,511 \$251,630,387 \$309,005,477

Among the imports of general merchandise were articles valued as follows:

Quant.	Value
299	\$2,735
Brass goods...	16 3,306
Brasses...	12 3,100
Chains and anchors...	43 2,250
Cutlery...	63 15,190
Guns...	25 4,945
Hardware...	15 1,192
Iron ore, tons...	1,100 2,163
Iron, pig, tons...	962 21,774
Iron cotton ties...	285 617
from other tons...	812 22,115
Iron, pigs...	2,030 14,200
Metal goods...	157 16,143
Needles...	15 6,373
Old metal...	882
Pew. caps...	13 2,073
Saddlery...	8 1,277
Steel...	1,351 19,131
Yellowware...	7 1,008
Tin, boxes...	1,647 79,995
Tin, 1,710 slabs...	135,588 22,910
Wire...	55 1,090

EXPORTS EXCLUSIVE OF SPECIE.

For the week ended Sept. 19:

	1874.	1875.	1876.
Total for week... \$4,364,724	\$4,620,233	\$5,422,571	

Prev. reported. 208,359,021 177,228,970 186,606,623

Since Jan. 1... \$212,713,745 \$181,909,309 \$192,029,194

EXPORTS OF SPECIE.

For the week ended Sept. 16:

	1874.	1875.	1876.
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Total for the week... \$499,723

Previously reported. 39,833,723

Total since Jan. 1, 1876... \$40,263,445

Same time in 1875... 64,592,829

Same time in 1874... 41,889,443

Same time in 1873... 40,926,206

Same time in 1872... 57,262,826

Government bonds close as follows:

Bid.	Asked.
------	--------

U. S. Currency 6s... 125 1/2 127

U. S. 6s 1851, reg. 117 1/2 117 1/2

U. S. 6s 1851, com. 118 1/2 118 1/2

U. S. 5-20 1865, com. 113 1/2 113

U. S. 5-20 1865, new reg. 113 1/2 113 1/2

U. S. 5-20 1865, com. 113 1/2 113 1/2

U. S. 5-20 1867, reg. 116 1/2 116 1/2

U. S. 5-20 1868, reg. 118 1/2 118 1/2

U. S. 5-20 1868, com. 119 1/2 119 1/2

U. S. 10-40 reg. 115 1/2 115 1/2

U. S. 10-40 com. 115 1/2 115 1/2

U. S. 5s 1881, reg. 115 1/2 115 1/2

U. S. 5s 1881, com. 115 1/2 115 1/2

U. S. 4 1/2s 111 1/2 111 1/2

The following were the closing quotations of active shares at the close of business to-day:

Bid.	Asked.
------	--------

Atlantic & Pacific R. R. Preferred... 13 1/2 2

Atlantic and Pacific Telegraph... 15 1/2 16 1/2

Chicago & Northwestern... 16 1/2 37

" " 61 1/2 61 1/2

Chicago Rock Island and Pacific... 104 104 1/2

Chicago, Bur. & Quincy... 116 117

Col. Chic. & Ind. Cent. 3 4

Dbl. Cu. Gunlets and Bits... 40 50

Cast Steel Cut Augers and Bits... 40 50

Patent Extension Bits... 30 30

Axe, Pick and other Handles... 20 20

Barrel's Best Hand Tools... 20 20

" Round Sand " 70 10

Eureka Flint and Emery Paper, &c... 15 15

Cast Iron Hatchets... 10 10

Tacki Blocks, &c... 10 10

We have received the following:

To THE TRADE: Having transferred my entire interest in the manufacture of the above

United States Express...	63	64
Wells, Fargo & Co. Express...	83 1/2	84 1/2
Erie...	10	10 1/2
Harlem...	130	135
Hannibal & St. Joseph...	12 1/2	13 1/2
Pref...	21	22
Illinoia Central...	84 1/2	85 1/2
Kansas and Texas...	7 1/2	8
Lake Shore...	53 1/2	53 1/2
Michigan Central...	41 1/2	41 1/2
Milwaukee & St. Paul...	30 1/2	30 1/2
Pref...	62 1/2	62 1/2
Mariposa...	4	6
New York Central...	5	6
New Jersey Central...	28 1/2	28
Ohio & Mississippi...	13 1/2	12 1/2
Panama...	128	130
Pittsburgh & Fort Wayne...	104 1/2	105
Pacific...	23 1/2	23 1/2
Pref...	18	18
St. L. Kan. City Northern...	5 1/2	6
Pref...	28 1/2	29
Tol., Wabash & Western...	3 1/2	4
Union Pacific...	62 1/2	62 1/2
Pref. Western Union Telegraph...	69 1/2	70

Blind Hinge to Messrs. Clark & Co., of Buffalo, N. Y., I would respectfully inform my customers, and the trade generally, that Messrs. Clark & Co. are now the sole manufacturers of this Hinge.

O. S. GARRETSON,
Buffalo Hardware Co.

As we have arranged with Mr. O. S. Garretson (Buffalo Hardware Co.) for the exclusive manufacture of the above Blind Hinge, we would say to our customers, and the trade generally, that the unprecedented low prices for Blind Hinges, which have so long prevailed, compel us to advance our prices, from this date, as follows:

Price List.

No. 1, For wood, throws the Blind 1 1/2 inches	Per doz. sets.
--	----------------

fact that bottom prices have been reached and people have a confidence in the continuance of the present state of affairs. Freights seem to be firmer.

The Lehigh and Wilkesbarre Coal Company quote as follows at Mauch Chunk:

Furnace Lump.....	\$250
Lump.....	275
Broken and Egg.....	280
Stove.....	300
Chestnut.....	250
" No. 2.....	150

The following are the prices of the Lehigh and Wilkesbarre Coal Company at Port Johnson:

	Lump.	Steamer.	Broken.	Egg.	Stove.	Chestnut.
Old Company's Summit.....	400	360	360	400	330	250
Honey-Brook Lehigh.....	400	360	360	400	330	250
Wilkes-Barre.....	325	325	350	350	300	250
Plymouth Red Ash.....	325	325	350	350	300	250

The following are the Pennsylvania Coal Company's quotations, as per their circular of the 1st:

	Delivered at Newburgh.
Lump, per ton of 2240 lbs.....	\$150
Steamer.....	310
Grate.....	325
Egg.....	325
Stove.....	400
Chestnut.....	360

A. S. Swords, of No. 111 Broadway, quotes for Pittston Coal, for delivery at Newburgh, during the month of September:

	Lump.....	Steamer.....	Broken.....	Egg.....	Stove.....	Chestnut.....
Lump, per ton of 2240 lbs.....	\$290					
Steamer.....	300					
Grate.....	325					
Egg.....	325					
Stove.....	400					
Chestnut.....	360					

The following are the prices of the Delaware and Hudson Canal Company for Coal delivered free on board vessel at Rondout, N. Y.:

	Furnace, Lump, per ton of 2240 lbs.....	Steamer, Lump, ".....	Grate.....	Egg.....	Stove.....	Chestnut.....
Furnace, Lump, per ton of 2240 lbs.....	\$25					
Steamer, Lump, ".....	325					
Grate.....	350					
Egg.....	325					
Stove.....	415					
Chestnut.....	375					

The following are the prices of the Philadelphia and Reading circular for Coal free on board at Port Richmond, is as follows:

	Chestnut.....
Broken.....	\$300
Egg.....	\$300
Stove.....	\$300
No. 1.....	\$300

In Bituminous Coal and Freight there is little or no change worth noting. We continue our quotations:

	Chestnut.....
Hard white ash.....	\$300
Free burning white ash.....	300
Schuykill red ash.....	300
North Franklin red.....	400
Lykens Valley.....	450

In Bituminous Coal and Freight there is little or no change worth noting. We continue our quotations:

	Chestnut.....
Westerly, at Georgetown.....	\$350
Cumberland, at Georgetown.....	450
West Virginia, at Baltimore.....	425
Newburg Oreg., at.....	450
Dasdorff, at Baltimore.....	450
Broad Top, at South Amboy.....	475
Morrisdale, Wiggins.....	475
Cunard, at Philadelphia.....	475
Consolidation Coal Co. f. o. b., Georgetown.....	365
Consolidation Coal Co. f. o. b., Baltimore.....	375
In Barrels at New York.....	550
Maryland Coal Co. f. o. b., Baltimore.....	400
Maryland Coal Co. f. o. b., Georgetown.....	375

FREIGHTS—PER TON OF 2240 LBS.

	From Elizabethport, Port Johnson, South Amboy, Hoboken & Newark N. J.	From Philadelphia.	From Baltimore.	From Georgetown.
Augusta, Me.....				
Albany.....		\$175		
Amesbury, Mass.....				
Bangor, Me.....	\$100		200	
Bath, Me.....	100		150	\$150
Boston, Mass.....	90	130	145	160
Bridgewater, Ct.....	70	95	140	140
Bristol, R. I.....	85			
Cambridgept., Mass.....	100			
Dighton.....		140	150	
East Cambridge.....	100			
Fall River.....	80	125	140	140
Hancock.....				
Hallowell, Me.....				
Hartford.....				
Hoboken.....	40	120	125	
Hudson.....		150	140	
Jersey City.....	40	120	125	
Lynn, Mass.....	110			
Middletown.....	90			
Mystic.....		150		
New Bedford.....	85	140	140	
Newburyport.....	110	165	170	
New Haven.....	55	140	140	
New London.....	80	140	140	
Newport.....	85	120	120	
New York.....	40	70	125	120
Norwalk.....	70	140		
Norwich.....	90	145		
Providence.....	90	145	150	
Philadelphia.....	90	145	150	
Portland.....	90	145	150	
Portsmouth, N. H.....	110	160	170	
Providence.....	80	125	140	
Poughkeepsie, N. Y.....		140		
Rockland.....	90			
Roxbury.....				
Saco.....				
South Harbor.....	100			
Salem, Mass.....	100	160	160	
Salisbury Pt., Mass.....				
Stamford.....	65			
Saybrook.....	75			
Stonington.....	80			
Taunton.....	65			
Troy.....	65			
Watertown, R. I.....	85			
Weymouth.....		145	160	
Wilmington, N. C.....		125		

8c per bridge extra. + and Sound Towing. Harbor Freights, 40 cents.

PHILADELPHIA.

Office of *The Iron Age*, 220 South Fourth St., Philadelphia, Sept. 19, 1876.

The week again opens with a good feeling throughout the trade, and the anticipations indulged for the past two or three weeks appear to have been at least measurably realized. Possibly we may be disappointed, and some men of long experience and close observation think there is nothing tangible to be seen yet upon which to base any hope of permanent improvement. The hopeful feeling prevails, however, and we are glad to report that it is very general, and such being the case, with low prices, magnificent crops, cheap labor, and capital in abundance, why should not the improvement be general and permanent? No thinking person expects that we shall pass from extreme depression to general activity, but if there

is a gradual resumption in some departments, may we not reasonably expect others to follow. Until recently the depression was universal; at present it is confined to some branches of trade, therefore we think there is good reason to hope that the improvement already experienced will become general and permanent—slowly it may be—but none the less sure and permanent. Over 425,000 paying visitors to the Exhibition last week; it is a grand success.

Pig Iron.—The market may be quoted firm and steady, with a considerable business doing within the range of our quotations. Lots pressed for sale, and unknown brands, have been sold at some reduction, but standard brands are firmly held with no disposition on the part of holders to press sales. The transactions of the week have been unusually large, amounting in all to upward of 12,000 tons, with further inquiry for round lots. We quote: No. 1 Foundry, \$22 to \$25; No. 2 Foundry, \$20 to \$22; and Gray Forge, \$18 to \$20.

ores.—Nothing doing; prices entirely nominal. Buyers could obtain concessions on quotations. Offerings f. o. b. at Richmond, Va., are as follows: Magnetic, \$4; Specular for Bessemer, \$45; Selected ditto, 65 to 70 per cent. of Metallic Iron, \$5. At Cleveland, Lake Superior, \$7; and Republic Mine, \$7.50.

BLOOMS.—There are sellers at the following quotations—market very weak: Charcoal Scrap Blooms, \$47; Charcoal Ore Blooms, \$41 to \$42; Charcoal Bilets of superior quality, from \$60 to \$62; and Bars for converting into Steel, made of best Champlain Iron, \$75. Strictly Cold Blast Charcoal Blooms, Hammered, are quoted at \$62 to \$64, with free sales; and Bilets, \$70 to \$74.

Manufactured Iron.—As a rule, business is very dull, and no improvement can be noted. Plate, Tank and Sheet Iron is more active, and the mills are generally fully employed, with a fair prospect of a good fall trade. Bar Iron is very dull, however, and all the mills are on short time, with no immediate prospect of improvement. Complaints are made that the Western mills are selling delivered here at very low rates; so low, in fact, that our manufacturers decline to compete with them. Prices are, in consequence, very irregular; 23c. is the nominal quotation, but no large lots could be placed at anything like that price. As covering the whole market, probably 2c. to 23c. may be given as the range. Western prices said to be 21c. delivered here.

Horseshoe Iron.—We make no change in quotations, which are \$70 per ton for 13x13c.

Rails.—We cannot learn of any sales of importance, but there is a little more inquiry, and probably the low prices may induce buyers to take hold

EAST INDIES.

(Gilliland, Wood & Co.)

SINGAPORE, July 29, 1876.—*Tin*.—It has declined, and the market closes at \$22 per picul. The latest news from Penang quotes the market rather firmer at \$21 48 per picul for unsmelted Tin, with buyers for China.

(Gilliland, Wood & Co.)

PENANG, July 24, 1876.—*Tin*.—The market opened at \$20 30 to \$21 40 per picul for unsmelted, on departure of last mail. The market is very nearly cleared at \$21 40 per picul for unsmelted. Since no further advance could be established, the metal ran up to \$22 97 1/2 per picul for remelted, but on account of higher rates of exchange, declined again to \$21 65 per picul for unsmelted. Stocks in the bazaar aggregate about 900 piculs. *Exchange*.—The sterling rates experienced a further decline, the closing quotation for last mail being 3 9/16 to 3 9/16 for 6 months' sight bank note, and 3 1/2 months' after date of issue, the rates further gave way, reaching at one time 3 7/8 to 3 7/8, but subsequently took a somewhat firmer tendency, and close for this mail as follows: London 6 months' sight bank 3 1/2; credits, 3 1/2; documents, 3 7/8; Bombay and Calcutta on demand, bank 23 1/2; Honkong on demand, bank par; Singapore on demand, private 1/2 to 2/4 per cent, premium; Pillar dollars, 7/8 per cent.; 2/4 guilder pieces, 12 cents.

AUSTRALIA.

(York Peninsula Advertiser.)

ADELAIDE, July 11, 1876.—*Copper*.—The Kurilla Mine.—Every satisfaction is felt as to the prospects of this mine. The sales of ore are gradually increasing, and the deepest worked parts are improving. A sale of 80 tons of ore has just been made, and three piles are now lying on the floors, being sampled and waiting for tenders, of over 100 tons of 20 per cent. The mine is now over 300 tons to a man for future sale. We are told that the Kurilla lode, in the 35 fathom level eastward toward the Devon consols, is very rich, being nearly 4 feet of solid yellow ore of 20 per cent. or above. Since our last monthly summary several important and required changes have been made. The old hoisting of the engine has been removed, and a new one built of much better material, and consequently of much greater power. The old engine, which had been fixed, and a splendid new piston and rod have been made by Messrs. May & Tonkin, of the Wallaroo Foundry, to replace the old ones that had become worse for the wear.

Our English Letter.

Review of the British Iron, Steel, Metal and Hardware Trades.

(From our Regular Correspondent.)

SHEFFIELD, ENG., Sept. 4, 1876.

THE EASTERN WAR

continues to attract great attention here, and in well informed circles an opinion prevails that we are now on the eve of a most grave crisis—a crisis which may involve half Europe being fought for. It is believed that the attitude and ambitions of Russia portend an interference by that power which will of a certainty excite the resentment of Great Britain, and, it may be, of Austria, and thus provoke war on a large scale.

Russia is, of course, not only a bear, but a bugbear, to this country, and, consequently, the Russophobists may be in a state of unnecessary ferment. Yet, as I have briefly stated, such are the views which are propounded almost universally just now. In the meantime we await the development of events, and are joining in one great and strong cry in denunciation of the hellish Turkish atrocities in Bulgaria. The special correspondent of the London *Daily News* (an American Celt, Mr. McGahan), who first made public these truly diabolical crimes—horrors that are totally unworthy even of Dahomey—is still sending able and evidently accurate reports from the scene of war, and this country is very rapidly coming to the conclusion that the Turk must very soon be expelled from Europe. At present his rapacity and lust, his ignorance and fanaticism, his idleness and obstructiveness, are constant inherent sources of danger, and when any of these sufficient causes is intentionally or accidentally made prominent, all Europe is set agog, and has before now been set ablaze. I think this country does not ask too much when it asks to be freed from any further contingent liabilities on behalf of the descendants of Osman.

THOMAS VAUGHN & CO.

have at length "gone into liquidation," which is nowadays anything but a severe phrase. The result is what might have been anticipated amongst so many creditors, any one of whom being dissatisfied and having a claim for over £50 might precipitate the thing by filing a petition. The partners in the firm are Thomas Vaughan and George Needham, and the petition describes them as iron-masters, iron manufacturers, ironstone and coal mine owners, and bolt and nut manufacturers, carrying on business at Middlesbrough, Clay Lane, South Bank, and South Skelton, Yorkshire; Bishop Auckland, Whessoe Woodhouse Close and South Meadoway, Durham, and in Cannon street, city of London. The liabilities were stated to be about £1,000,000, and the solicitor who made the application for the appointment of a receiver said the wages payable to the workmen, even now, were £4000 weekly. As I have stated on former occasion, the assets are £1,250,000, but in the present state of trade it would be almost impossible to realize them in a satisfactory manner. Under these circumstances it appears highly probable that the concern may be converted into a "limited," which, with good management and patience, might do well when trade does revive. Mr. Vaughan, I may say, is the only son of the late John Vaughan, who has been called "the commercial discoverer of Cleveland," and who died eight years ago, leaving his son Thomas personal property worth more than half a million of money, beside landed, &c., property worth as much more. All this has gone somewhere in the interval, and now little remains beside the worth of the iron works and collieries. Where the balance has gone to will, in all probability, transpire at the meeting of creditors, to be held September 21st. These meetings of creditors, I may first remark, are usually hinged farces, and, as a natural consequence, debtors may do what they like and never be called to account. Other than this,

FURTHER GREAT FAILURES

have occurred, and are daily occurring with a somewhat alarming persistency. Messrs. Swan, Coates & Co., who have four blast furnaces at South Bank, near Middlesbrough, and ironstone mines at Skinningrove, Cleveland, have resolved to file a petition. Their liabilities are £250,000. The Lockenby Iron Company, with four blast furnaces at Coutham, has stopped, with liabilities set down at about £300,000. Other failures on a smaller scale, in Cleveland, bring up the total losses of the district to about £2,000,000 sterling. Outside Cleveland, the Demon of Distrust (to speak *a la Carlyle*) has been actively at work. Mr. I. B. Walker, ship builder, Barrow, is down for £40,000. At Sheffield, Messrs. G. W. Dyson and G. E. Hodgkinson, steel forgers, have petitioned, with about

£40,000 worth of debts. In London, F. C. & J. Goodfellow, book sellers, have "gone down" for £12,000. At Leeds, Mr. J. Wilson, glass manufacturer, has petitioned, owing about £40,000. At Dewsbury, James Wormald & Sons, contractors, have failed, owing £50,000. At Bradford (Yorks), Messrs. Gurney & Wilson set down their liabilities at £34,125, whilst at Oldham the following failures have taken place during the week: John Winterbottom, stationer, £22,770; James Winterbottom, jeweler, £34,000; Thomas Marsden, builder, £27,022, and Messrs. Henry and Abel Canfield, wool staplers, £47,582. A Leeds firm of stockholders have succumbed with a nominal indebtedness of £39,140, but I suppose this will be an exaggeration.

SOME FEW EXPLOSIONS

of a material, not financial, nature, have occurred during the week, involving loss of life and much destruction of property. At Hull, a boiler exploded, killing Thos. Rose on the spot, scalding the owner of the premises and his three sons very severely, and wrecking the place very effectively. At the Monkland Iron Works, Scotland, a boiler also blew up with such force as to wreck a two story building and kill Henry Thompson (the engineer), beside injuring several other persons. At Edinburgh, a glove cleaners' establishment was ransacked by an explosive compound, two female assistants being badly burned. At Bristol, Mr. Wm. Coffin—suggestive name!—has been fined for keeping 10,000 cartridges, a few barrels of powder and other "mixtures" in a crowded neighborhood.

THE WEEK'S FIRES,

however, more than compensate for our poor display in the matter of explosions. It is often thus with us. When we fall short in one respect we experience abundance in another. As Artemus Ward expressed it, when we are tired of bacon we can go to "carpidge," and when that succulent vegetable falls upon the satiated palate, then can we hie back to deceased pig and feast upon the porcine product! But, as to the fires: At Edinboro, the Caledonian distillery exploded slightly and then inflamed greatly, a man in charge being burnt to death, and heavy damage done. At a rural spot called Chipping Warden, a man upset a benzine lamp, wherefrom a blaze was kindled which was not satisfied until it had totally destroyed four entire houses and part of a fifth. At Paisley, part of the foundry of Messrs. Craig was burned, the damage being estimated at £10,000 or thereabouts. At Bailey, the woollen manufactory of Messrs. Jubb was wholly "conflagrated," the damage being £50,000. At Wenn, Cornwall, two houses were burned down. At Highgate, London, the chandler factory of Mr. Ford was nearly destroyed, and a number of firemen injured, owing to the fall of a great length of wall.

ONLY ONE RAILWAY ACCIDENT

of any moment has taken place during the week—a fact which does not say much for the lion's providers—the careless pointsman, the groggy driver, the negligent guard, *et hoc genus omne*. This solitary accident was brought about by the mail train from Carlisle to Scotland running into the debris of a goods train which had broken down and fouled both lines of rails. A number of people were hurt.

HEAVY RAILWAY EXPENDITURES

are now going on in this country. The Great Northern is extending into Derbyshire at a cost of over £2,000,000. At Derby, the Midland is spending over £500,000 in the erection of carriage shops, &c., beside £1,500,000 on various extensions, sidings, &c. At Middlesbrough the North Eastern has spent £127,497, up to June 30th, on new docks. At Ferry Hill the same company is expending £40,000; at West Hartlepool, £257,000; at Monkwearmouth Junction, £253,000; at Byker and Percy Main, £227,000; at South Shields, £254,000; at Sunderland and Hawes, £36,000, and at York the new central station is costing £270,000. These are independent of many minor projects now in hand.

SCOTCH PIG IRON

is, at the moment, a trifle better than it has been, but I presume any real improvement is out of question with 81,965 tons in Connal's stores, and a duller state of trade than ever to contend with. There is no change in freights, and the number of furnaces in blast is 115, or within one of the number blowing at the same date of last year.

Messrs. James Watson & Co., Sept. 1, say: "The Scotch pig iron market was buoyant on Monday, business being done from 55 1/2% to 56 3/4, cash; on Tuesday it declined to 55 10/4 and since then the price has gradually improved to 56 1 1/2, cash, and 56 3/4, one month open, closing buyers at the latter figures, sellers three half pence higher. Shipments last week were 10,550 tons, against 10,232 tons in the corresponding week of 1875."

Messrs. John E. Swan & Bros. (limited) figures are somewhat different, thus:

Glasgow Brands.	No. 1.			No. 3.		
	Furnaces 115	Furnaces 116	Furnaces 117	Furnaces 115	Furnaces 116	Furnaces 117
Gartsherrie.....	13	3	16	63 6	55 5	58 8
Coltness.....	12	0	12	66 6	55 5	56 1
Summerlee.....	6	1	8	52 6	54 5	55 1
Langdon.....	4	0	5	65 5	54 9	57 5
Carphoe.....	4	0	5	56 5	54 6	55 1
Calder, at Port Dundas.....	64 6	56 5	56 5	64 6	55 6	56 1
Glengarnock, at Ardrossan.....	62 6	56 5	56 5	62 6	55 6	56 1
Eglington.....	56 6	55 5	55 5	56 6	55 6	56 1
Dalmeny.....	56 6	55 5	55 5	56 6	55 6	56 1
Shotts, at Leith.....	65 5	57 5	57 5	65 5	57 5	57 5
Kinnelby.....	57 6	56 5	56 5	57 6	56 5	57 5

Messrs. John E. Swan & Bros. (limited) figures are somewhat different, thus:

Glasgow Warrants.	No. 1.			No. 3.			No. 4.		
	Furnaces 115	Furnaces 116	Furnaces 117	Furnaces 115	Furnaces 116	Furnaces 117	Furnaces 115	Furnaces 116	Furnaces 117
Gartsherrie.....	13	3	16	63 6	55 5	58 8	62 6	54 5	57 5
Coltness.....	12	0	12	66 6	55 5	58 8	63 6	55 5	58 8
Summerlee.....	6	1	8	52 6	54 5	55 1	57 6	55 5	58 8
Langdon.....	4	0	5	65 5	54 9	57 5	62 6	55 5	58 8
Carphoe.....	4	0	5	56 5	54 6	55 1	61 6	55 5	58 8
Calder, at Port Dundas.....	64 6	56 5	56 5	64 6	55 6	56 1	64 6	55 6	56 1
Glengarnock, at Ardrossan.....	62 6	56 5	56 5	62 6	55 6	56 1	62 6	55 6	56 1
Eglington.....	56 6	55 5	55 5	56 6	55 6	56 1	57 6	55 6	56 1
Dalmeny.....	56 6	55 5	55 5	56 6	55 6	56 1	57 6	55 6	56 1
Shotts, at Leith.....	65 5	57 5	57 5	65 5	57 5	57 5	66 5	58 5	59 5

Glasgow Warrants, 3-5 No. 1; 2-5 No. 3, g. m. b., 56/2.

WEST COAST BRANDS—f. o. b. Ardrossan.

Iron: f. o. b. in Liverpool, per ton.

£ s. d. £ s. d. £ s. d.

Merchant bar..... 8 12 6 6 15 0

Merchant bar, in Wales..... 6 2 6 6 6 5

Staffordshire..... 7 5 0 7 15 0

Hoop..... 6 0 0 6 0 0

Sheet..... 9 10 0 9 10 0

Nail rod..... 7 10 0 7 10 0

Ba, best crown..... 7 5 0 7 5 0

Chapeltall..... 2 0 0 2 0 0

Clyde..... 5 0 0 5 0 0

Quarter-Clyde..... 4 0 0 4 0 0

Boiler plates..... 9 15 0 9 15 0

New Custom House Regulations.

The following in regard to the new Custom House regulations is of interest. The date is the 19th:

The Acting Secretary of the Treasury has issued a circular to collectors of customs, declaring that hereafter Article 640 of the General Regulations of 1874 will be understood to require all appraised merchandise transported in bond to be either corded and sealed or placed in cars secured by customs locks or seals. Such bulky and unwieldy articles as can be transported only on platform cars or the decks of vessels need not be corded and sealed, provided the manifests for the same describe the articles with sufficient accuracy to enable customs officers to identify them at the port of arrival.

He has also issued a circular amending the regulations governing the transportation of merchandise to, from and through the British Possessions of North America, so as to provide that merchandise of domestic origin, duty paid or free of duty, may be transported from one port to another of the United States over the territory of the Dominion of Canada, with the consent of the proper authorities, by routes duly designated and bonded for such purpose. Cars must be specially appropriated for such transportation, placed under the customs seal by an officer of the customs at the port of departure in the United States, and remain thus sealed until they shall have passed through such foreign territory and again arrive in the United States. Collectors of customs on the frontier may, however, allow railroad cars laden for transit through Canada to remain unsealed when such cars contain perishable merchandise or valuable animals requiring the special care of attendants during transit, and when such animals or merchandise are capable of identification by specific description in the manifest of the car containing the same. In all other cases when it is desired to transport live stock or other merchandise through the Dominion of Canada in unsealed cars, the collector will detail a regular or temporary inspector of customs to accompany such cars during the transit, the expense of which service shall be paid by the party at whose request the same is rendered.

All bulky merchandise which is incapable of being put in sealed cars may be transported on platform cars.

Solar Heat and Sun Spots.—The present season has been extraordinary in many respects, but the intensity of heat in July and August has signalized it as quite without a parallel in meteorological records. The Boston *Journal of Chemistry*, in speaking of this subject, says that the heat has been intense not only in all parts of our country, but in Europe as well. The absence of sun spots, which has been noticed since the last week in March, may have some bearing upon this excessive evolution of solar heat. If large areas of the sun's disk, which are usually to some extent eclipsed, have this season been constantly luminous, it would appear plausible to connect sun spots with solar energy and with range of temperatures upon our planet. They have not, however, we believe, been regarded as capable of producing planetary disturbances of this kind. But we know that the nature of these spots is quite imperfectly understood, and although great light and heat energy exists in all parts of them, even in the darkest, still this may not prove that they have no cooling influence. A long series of careful observations can alone settle this point—a series much more extended than any yet undertaken. The immense activity at present in the study of solar physics will undoubtedly soon greatly enlarge our knowledge upon the possible connection which may exist between terrestrial heat and sun spots.



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February 29, 1876.

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ALLIS, BULLARD & CO., Limited. Railway and Machinists' Supplies. Machinery and Metals. Specialty made of Second-Hand Iron Working Machinery.

14 DEY STREET, NEW YORK.

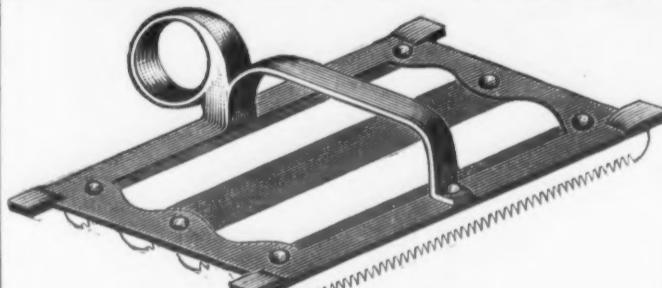
STEEL STAMPS. LETTERS, FIGURES, &c., of every description and for all purposes. Best Work. Lowest Prices.

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HOTCHKISS' PATENT NOVELTY COMBS.



THIS CUT ILLUSTRATES THE GRASPING OF THE COMB.



Manufactured by
HOTCHKISS' SONS,
Bridgeport, Conn.

These Combs do not infringe upon the rights of any one. They are the Simplest, Neatest and Most Durable CURRY COMBS ever offered to the trade, affording an easy grasp for the hand, without the use of the ordinary side handle, and are universally acknowledged to be superior to all others. They are neatly put up in paper boxes of one dozen each, and packed 24 dozen in a case. Special Net prices furnished on application.

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AUSABLE HORSE NAILS POLISHED OR BLUED. HAMMERED AND FINISHED



The Ausable Nails

Are Hammered Hot,
And the Finishing and Pointing are
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Thus Imitating the Process of Making Nails by Hand.

Quality is Fully Guaranteed.

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Bradley's Cushioned Hammer

Has won golden opinions from the Mechanical World during the four years it has been before the public, and has reached a sale of 190 hammers, all in successful operation in this and foreign countries.

It Has More Good Points, Less Complication, More Adaptability, Larger Capacity, Does More and Better Work, Takes Less Power, Costs less for Repairs

than any other Hammer in the World. GUARANTEED AS REPRESENTED.

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Western Office, 22 S. Canal St., Chicago, Ill., A. B. BARNES, Manager.

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It has Won the Praise of Thousands.



The above cut shows the shape and design of the **COTTAGE FLY TRAP**. It is JAPANNED & dark red color, with bronzed border, the ends neatly lettered and ornamented. IT HAS A NEAT AND ATTRACTIVE APPEARANCE and does not look out of place in the dining room or parlor.

The experience of last year warrants us in fully recommending it as **THE BEST FLY TRAP IN THE MARKET**. It surpasses all others in catching flies. Its capacity for doing so being FOUR TO SIX TIMES GREATER than the so-called "Cone Trap." It is compact, and its construction is so simple that a child can bait and manage it. Its price is low as compared with all others. A trial will convince any one that it has no superior.

PRICE PER DOZEN, - - - - -

Special prices made to large dealers. We solicit your orders.

Patented August 18, 1874.

\$6.00.

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DOOR LOCKS, LATCHES, BUTTS, BRONZE TRIMMINGS, and ARCHITECTURAL BRONZE WORK GENERALLY.

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Warehouse, 87 Chambers & 69 Broad Sts., New York.

C. RIESSNER & CO., MANUFACTURERS, No. 242 Pearl Street, NEW YORK "SUMMER QUEEN"

Oil Cook Stove.

FOUR SIZES.
Suitable for all purposes, for Cooking, Baking and Ironing.



NON-EXPLOSIVE.



We beg to announce to the trade that our **NEW CENTENNIAL GAS STOVE** is now ready, and feel no hesitation in claiming it to be the most Perfect and Economical Stove in the market.

GREENFIELD TOOL CO., Greenfield, Mass. Sole Manufacturers of the Celebrated

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L. COES'
Genuine Improved Patent
SCREW WRENCHES.



Manufactured by
L. COES & CO.,
Worcester, Mass.

Established
in 1839.
Registered March 31, 1874.

We invite the particular attention of the trade to our New Straight Bar Wrench, *widened*, full size of the larger part of the so called "reinforced or leg bar." Also our enlarged jaw, made with ribs on the inside, having a full bearing on the front of bar (see sectional view), making the jaw fully equal to any strain the bar may be subjected to.

These recent improvements in combination with the nut inside the ferrule firmly screwed up flush, against square, solid bearings (that cannot be forced out of place by use), verifies our claim that we are manufacturing the strongest Wrench in the market.

We would also call attention to the fact, that in 1869 we made several important improvements (secured by patents), on the old wrench previously manufactured by L. & A. G. Coes which were at once closely imitated and sold as the *Genuine Wrench* by certain parties who seem to rely upon our improvements to keep up their reputation as manufacturers, and although the fact of their imitating our goods may be good evidence that we manufacture a superior Wrench, we wish the trade may not be deceived on the question of originality. Trusting the trade will fully appreciate our recent efforts, both in improvements on the Wrench and in the adoption of a Trade Mark, we would caution them against imitations. None genuine unless stamped.

"L. COES & CO."

Warehouse, 97 Chambers St., & 81 Reade Sts., N. Y.
HORACE DURRIE & CO., Sole Agents.



STAFFORD MANUFACTURING CO.'S
Stencil Combinations.



Containing: Stencil Alphabet, Figures, Can Stencil Ink and Brush.

For marking boxes, barrels, bags, and packages for shipment. Printing all manner of showcards, notices, signs, numbers, prices, &c., and other purposes too numerous to mention. Instructive and amusing for boys.

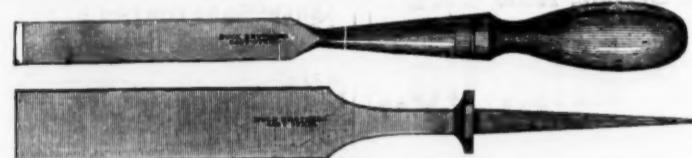
WHOLESALE PRICES.

Size.	Size.	Price.
2 in., per dozen	1 1/2 in., per dozen	\$10.00
3/4 in.	2 in.	6.50
1 1/2 in.	2 1/2 in.	12.00
1 1/2 in.	3 in.	7.00
1 1/2 in.	3 1/2 in.	18.00
1 1/2 in.	4 in.	9.00
1 1/2 in.	4 1/2 in.	15.00

An illustration of sizes sent on application.

For sale by Hardware Dealers and Stationers.

No. 66 Fulton Street, New York.



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The most complete assortment in the U. S. of **Shank, Socket Firmer, and Socket Framing Chisels.**

PLANE IRONS.

Gouges of all lengths, and circles beveled inside or outside. Nail Sets, Scratch and Belt Axes, Chisel Handles of all kinds. Orders filled promptly; generally same day as received.

WESTON'S

Differential Pulley Blocks

Also known as

DOYLE'S, HALL'S AND BIRD'S

are now all merged and are controlled exclusively by

THE YALE LOCK MFG. CO.,

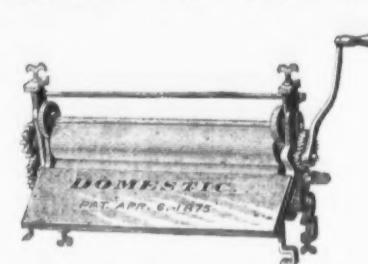
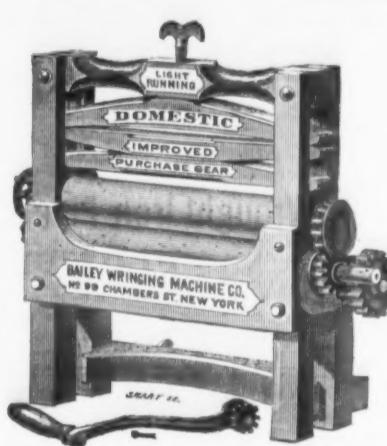
HENRY R. TOWNE, President, Stamford, Conn.

VAN WART & McCOY, New York Agents, 134 & 136 Duane Street.

T. A. WESTON, Mechanical Engineer, with the Company.



THE
"Light Running"
DOMESTIC WRINGER. DOMESTIC MANGLE.



With Anti-Friction Rolls,
FOR IRONING CLOTHES WITHOUT HEAT,

giving a **GLOSS** and **BRILLIANTY** of luster to linens impossible to be obtained from heated irons and in

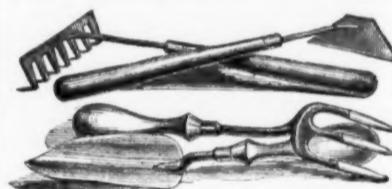
ONE-QUARTER OF THE TIME.

The power required to work this Mangle is **DIMINISHED MORE THAN ONE-HALF**, and a child 12 years of age can work it easily.

It is a well established fact that clothes mangled are more healthy and last longer than when done by the hot iron.

BAILEY WRINGING MACHINE COMPANY,

99 Chambers Street, New York.



This set of **GARDEN TOOLS**, is put up in a nice paper box, and is superior to any other in the market.

The tools are made of the best quality of Steel, highly polished, and of malleable iron polished or painted, with birch handles. We will make it an object for every dealer to handle them.

PRICE \$15. PER DOZEN SETS.

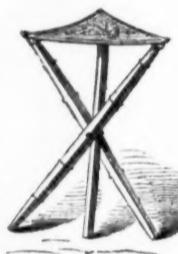
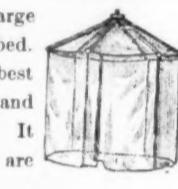
This **MOSQUITO BAR** is large enough to cover a full size bed. It has a nice Folding Frame, best quality of netting, with cord and ring complete for hanging. It is as good as those which are usually sold for \$5.00.

PRICE, \$24 PER DOZEN.



This Chair is made of the best second growth White Ash, finished on the wood, with Brussels Carpet Seat. It shuts up to the size of a single chair post, and weighs only one pound. Every person who forgets to take one with him when he goes to the Centennial, will be sorry when he gets there, as no chairs are provided for visitors, and they get very tired. Every store in the land can sell a few of them at a profit. They are a very popular article here.

PRICE, \$12 PER DOZEN.



MILLERS FALLS CO., 74 Chambers St., N. Y.

Corner BROADWAY.

THE EAGLE ANVIL

!! WARRANTED !!



ESTABLISHED 1843.

These Anvils are *superior* to the best English, or other Anvils, on account of the peculiar process of their manufacture (invented and used only by this concern), and from the quality of the materials employed.

The best English Anvils become hollowing on the face by continued hammering in use, on account of the fibrous nature of the wrought iron—causing it to "settle" under the face.

The body of the Eagle Anvils is of crystallized iron, and no "settling" can ever occur; the steel face, therefore, remains perfectly true. Also, it has the great advantage that the face of an Eagle Anvil does not "conquer" with less rebound, than a forged receiver the full effect of the hammer, instead of a portion of the work being wasted by the rebound, as of a wrought iron anvil. An equal amount of work can, therefore, be done on this Anvil with a hammer one-fifth lighter than that required when using a wrought iron anvil.

The working surface is in one piece of JESUP'S BEST TOOL CAST STEEL, which, being accurately ground, is hardened and given the proper temper for the heaviest work. The horn is covered with and its extremity made *entirely* of steel. The body of the Anvil is of the strongest grade of American iron, to which the cast steel face is *warranted* to be thoroughly welded and not to come off.

NEW PRICE LIST. ANVILS of 100 lbs. to 900 lbs., 10c. per lb.

Small Anvils, ("Minims.")

No. 60 0 1 2 3 4 5 6 7 8 9
10 lb. 15 lb. 20 lb. 30 lb. 40 lb. 50 lb. 60 lb. 70 lb. 80 lb. 90 lb.

Weighing about \$2.50 \$3.20 \$3.75 \$4.50 \$5.00 \$5.90 \$6.75 \$7.25 \$8.10 \$9.00 \$9.50

THESE GOODS ARE SOLD BY THE GENERAL AGENTS (with special discounts to the trade).

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SOMETHING NEW!
SAMSON WRENCH.



It is the only Wrench that will hold *Gas or Steam Pipe, Gas Burners, Round Iron or Steel* without slipping. Samples sent to the trade only on receipt of fifty cents and business card.

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4000 Remington Revolvers at Job Lot Prices.

JOHN P. MOORE'S SONS,

Wholesale Gun Dealers,

300 BROADWAY, N. Y.

ESTABLISHED 1823.

Everything in the Line. Bottom Prices Guaranteed.

ELEY'S GOODS.

Agents for COLT'S REVOLVERS, &c., &c.

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58 John Street, New York.

MANUFACTURERS OF

Wrought Iron

PIPE,

Cast Iron

LANGED PIPE,

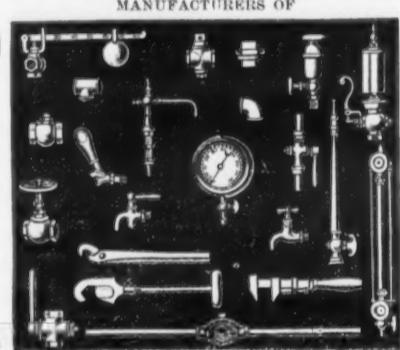
Cast Iron

RADIATORS

and BOILERS.

STEAM GAUGES, TOOLS.

And all Supplies used by Machinists, &c.



Brass & Iron
STEAM
Gas & Water
FITTINGS.
PLUMBERS'
MATERIALS.

The American Club Skate Still Ahead.



After the severest tests for the past four years, these skates are now admitted to be the only practical SELF-ADJUSTING SKATES IN MARKET. The clamps are first adjusted to the shoe by turning the thumb-screw D when the lever C is in the above position; when once adjusted, place the skate on the foot, close the lever C, and the skate is securely fastened to the foot. By the action of the clamps, the skate is always in the center of the foot, and cannot slide from side to side as in other club skates. They require no heel plates, key or wrench.

PRICE LIST.

Per Pair.

No. 1.—With Blued Footplate, and Runners the same as the best. \$5.00
No. 2.—Same as No. 1, only nicely Nickel Plated, effectively prevents the skate from rusting. 6.00
No. 3.—Same as No. 2, only before the skate is put together each part is finely polished and heavily Nickel Plated, the finest skate ever offered. 8.00

Sole Jobbing Agents for WINSLOW'S WOOD TOP SKATES.

Special trade catalogue sent on application. Address,

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John T. Lewis & Bros.,
No. 231 South Front St.,
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MANUFACTURERS OF
PURE WHITE LEAD, RED LEAD,
Litharge, Orange Mineral,
Linseed Oil
AND PAINTERS' COLORS.



The Atlantic White Lead and Linseed Oil Company,
MANUFACTURERS OF
White Lead (Atlantic), Red Lead,
Litharge & Linseed Oil.
ROBERT COLGATE & CO.,
287 Pearl Street, New York.

Established A. D., 1777.

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Manufacturers of

White Lead, Red Lead, Litharge & Orange Mineral.

Offices, 31st. St. below Chestnut, PHILADELPHIA.

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JOHN JEWETT & SONS,
Manufacturers of the well known Brand of

WHITE LEAD.



TRADE MARK.
White Lead, Red Lead and
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59 Maiden Lane, NEW YORK,
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For STEAM,

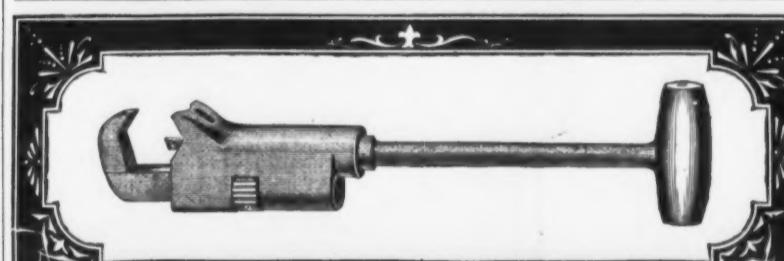
WATER and GAS.

Wrought Iron Pipe & Fittings, Plain and Galvanized
PLUMBERS' MATERIALS.

Illustrated Catalogue sent by express to the Trade on application.

Factorv, Paterson, N. J.

56 John Street N. Y.



The Acme Pipe Cutter.

MADE ENTIRELY OF SOLID CAST STEEL

Cuts Wrought Iron, Brass and Copper Pipes, Round Iron &c perfectly true without leaving burr on pipe, contracting or splitting it. Cuts out a chip similar to a lathe tool. The knife may be removed and ground. Send for descriptive circular to manufacturers.

Pancoast and Maxle
PHILADELPHIA PA.

When you visit the CENTENNIAL, don't fail to examine the

SELDEN DIRECT ACTING STEAM PUMPS,

No. 3408 PUMP ANNEX,

Especially the

COMPOUND CONDENSING ONE,

which is guaranteed to do the same work for 50 per cent. less fuel than any other Direct Acting Steam Pump now in the market.

A. CARR, Manufacturer, 43 Cortland St., N. Y.

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MINERS, DEALERS AND EXPORTERS OF HIGH TEST

Crystallized Black and Gray Oxides of
MANGANESE.

Ground, granulated and especially prepared to suit all branches of the home trade. Warranted to contain from 70 to 90 per cent. peroxide of manganese, and to give satisfaction with regard to price and quality.

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(Double and Single Gate, $\frac{1}{2}$ in. to 48 in.—outside and inside Screws, Indicator, &c.)

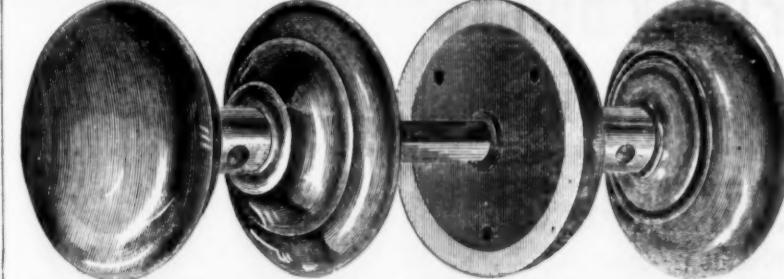
for Gas, Water and Steam. Send for Circular.

Also FIRE HYDRANTS.

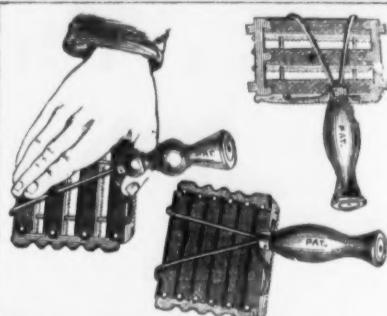
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BRIDGEPORT, CONN., Manufacturers of

Plain and Ornamental WOOD DOOR KNOBS, Shutter Knobs, Escutcheons, Etc.



The above represents our new **PLAIN DOOR KNOB**, which is unsurpassed for beauty of finish, durability and neat appearance. Can be furnished in Walnut, Oak, Ash, Maple, etc., etc. Send for catalogue and price list.



The Perfect Comb.

We call your attention especially to our new patent end-wire frame comb. The result of a long series of experiments to meet the requirements of the requirements of a **Perfect Comb**. It is better, stronger and more durable than any ever before invented. The raised wire shank gives when held never before attained, the strength and firmness for the handle. In such a position that the hand cannot come in contact with the wire while using the comb. The wire braces which run from the back over the back to the front teeth give strength and durability in a direction never before attained, and at the same time serve an important purpose, and when clasped by the fingers in connection with the raised shank the comb is more firmly, easily, and completely held, and with much less fatigue to the hand than is possible with other combs. In short, it needs but a trial to vindicate its name: **The Perfect Comb**.

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Proprietors and Manufacturers of

WHEATCROFT'S SELF-ADJUSTING



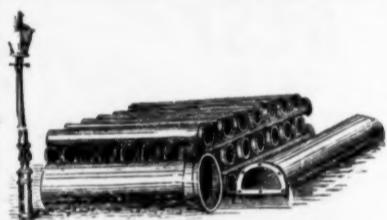
Pipe Wrench,

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MACHINE OILERS.

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Tubes for Gas, Steam & Water
1-16 to 48 in. Gas, Steam Fitters', Plumbers' and Machinists' Supplies. Boiler Tubes, Iron and Steel Boiler Plates, Rivets, Tools, Etc. Railroad Cars and all kinds of Railway Supplies. Iron and Wood Work for Cars, Bridges and Buildings.

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Coat, Makers of.	1
Linen Valley Coat Co., c/o Courtland and Church, N. Y.	7
Pardes A. & Co., 111 Broadway, N. Y.	7
The Hoboken Coal Co., Jersey City, N. J.	7
Coats.	1
Jewett John C. & Sons, Buffalo, N. Y.	10
Coffee and Spice Mills.	6
Leeds, 45 Jay, Millbrook, N. Y.	6
Enterprise Mfg. Co., Philadelphia, Pa.	6
Coil Chain.	1
Union Chain and Cable Co., Pittsburgh, Pa.	13
Compasses and Dividers, Manufacturers of.	13
Wm. & Call Hardw. & Tool Co., Springfield, Mass.	13
Compound.	13
Hornbostel Chas., 29 Broadway, N. Y.	22
Copper's Tools, etc., Dealers in.	22
D. R. Knapp, 100 Broadway, Rochester, N. Y.	22
Little Chas., 39 Fulton, N. Y.	24
Corn Huskers.	6
Chambers & Quinlan, Decatur, Ill.	10
Cotter Lines, (Galvanized Wire Strand).	1
Leeds, 45 Jay, N. Y.	36
Coat, Makers of.	1
Linen Valley Coat Co., c/o Courtland and Church, N. Y.	7
Pardes A. & Co., 111 Broadway, N. Y.	7
The Hoboken Coal Co., Jersey City, N. J.	7
Coats.	1
Jewett John C. & Sons, Buffalo, N. Y.	10
Coffee and Spice Mills.	6
Leeds, 45 Jay, Millbrook, N. Y.	6
Enterprise Mfg. Co., Philadelphia, Pa.	6
Coil Chain.	1
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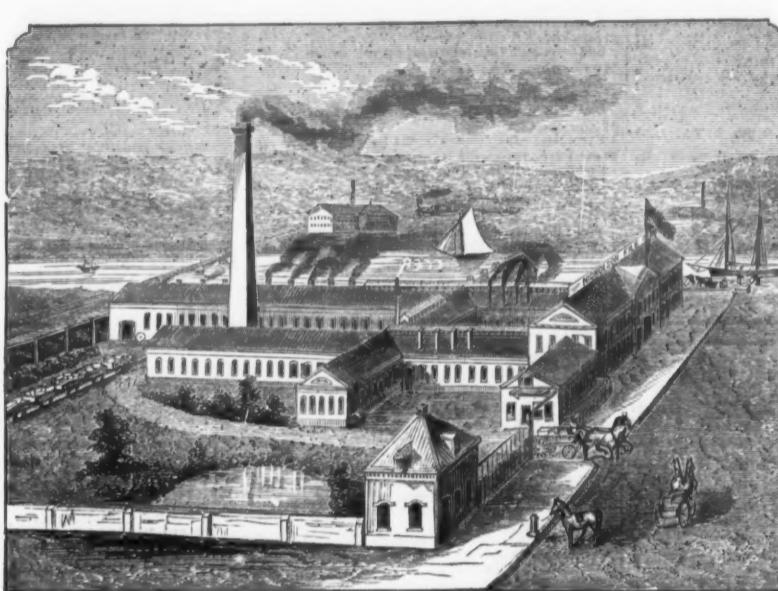
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of reliable quality for all purposes. Manufactured of the
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Communications should be addressed to the
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Keystone Saw, Tool, Steel and File Works.

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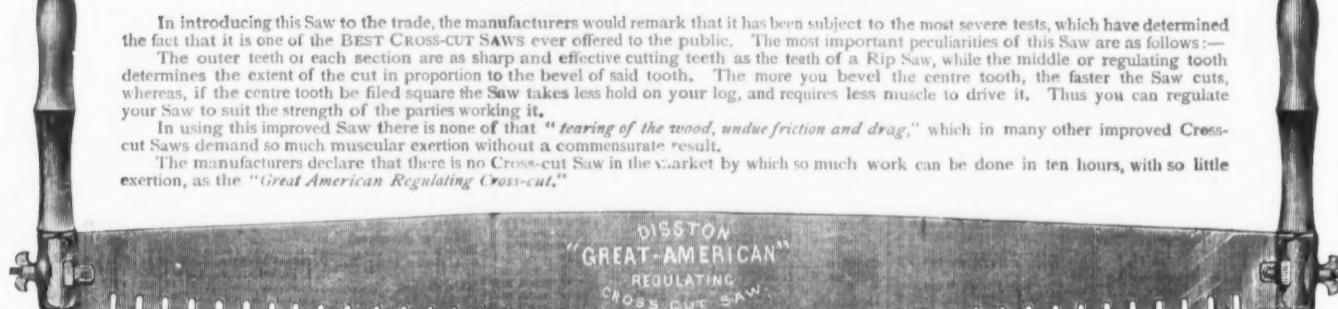
HENRY DISSTON & SONS, Hand, Panel and Rip Saws and Handled Saws OF EVERY DESCRIPTION.

THE GREAT AMERICAN.

In introducing this Saw to the trade, the manufacturers would remark that it has been subject to the most severe tests, which have determined the fact that it is one of the **BEST CROSS-CUT SAWS** ever offered to the public. The most important peculiarities of this Saw are as follows:—The outer teeth of each section are as sharp and effective cutting teeth as the teeth of a Rip Saw, while the middle or regulating tooth determines the extent of the cut in proportion to the bevel of said tooth. The more you bevel the centre tooth, the faster the Saw cuts, whereas, if the centre tooth be filed square the Saw takes less hold on your log, and requires less muscle to drive it. Thus you can regulate your Saw to suit the strength of the parties working it.

In using this improved Saw there is none of that "tearing of the wood, undue friction and drag," which in many other improved Cross-cut Saws demand so much muscular exertion without a commensurate result.

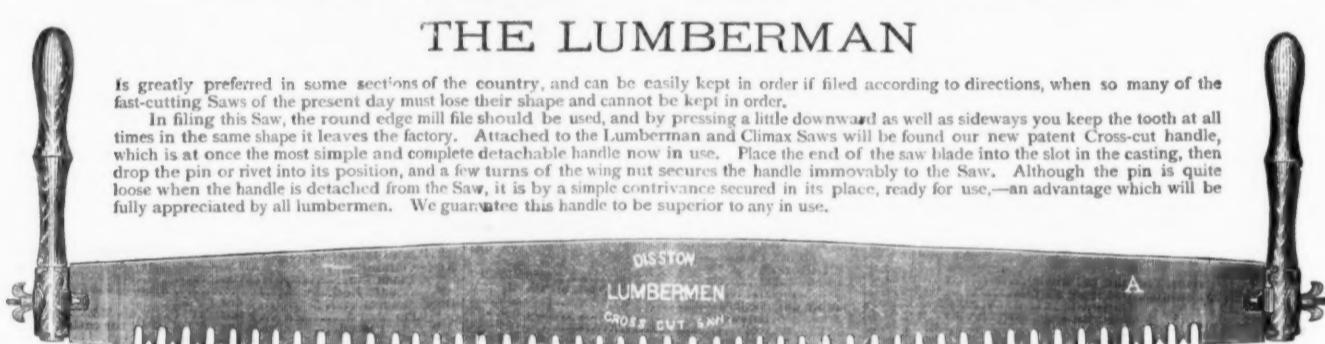
The manufacturers declare that there is no Cross-cut Saw in the market by which so much work can be done in ten hours, with so little exertion, as the "Great American Regulating Cross-cut."



THE LUMBERMAN

is greatly preferred in some sections of the country, and can be easily kept in order if filed according to directions, when so many of the fast-cutting Saws of the present day must lose their shape and cannot be kept in order.

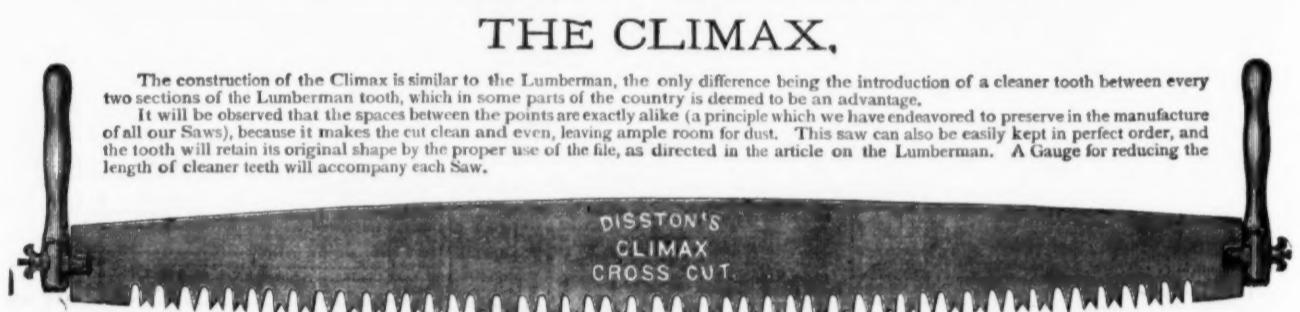
In filing this Saw, the round edge mill file should be used, and by pressing a little downward as well as sideways you keep the tooth at all times in the same shape it leaves the factory. Attached to the Lumberman and Climax Saws will be found our new patent Cross-cut handle, which is at once the most simple and complete detachable handle now in use. Place the end of the saw blade into the slot in the casting, then drop the pin or rivet into its position, and a few turns of the wing nut secures the handle immovably to the Saw. Although the pin is quite loose when the handle is detached from the Saw, it is by a simple contrivance secured in its place, ready for use,—an advantage which will be fully appreciated by all lumbermen. We guarantee this handle to be superior to any in use.



THE CLIMAX.

The construction of the Climax is similar to the Lumberman, the only difference being the introduction of a cleaner tooth between every two sections of the Lumberman tooth, which in some parts of the country is deemed to be an advantage.

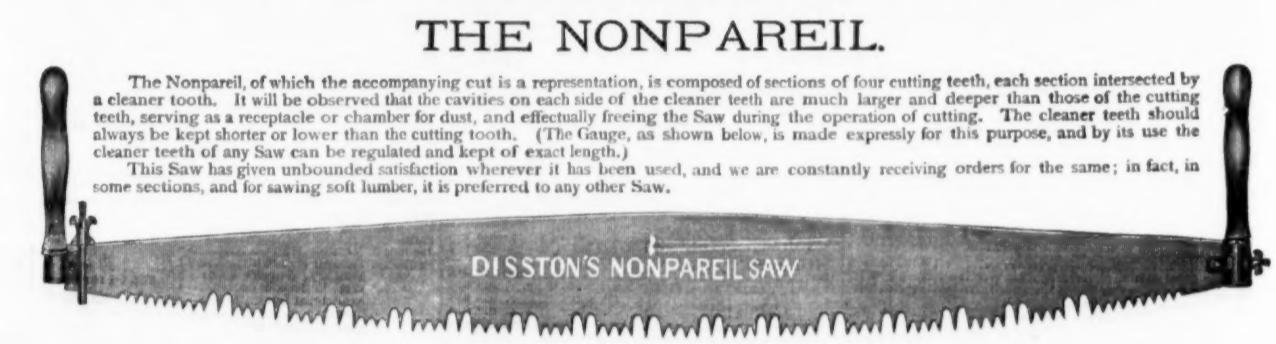
It will be observed that the spaces between the points are exactly alike (a principle which we have endeavored to preserve in the manufacture of all our Saws), because it makes the cut clean and even, leaving ample room for dust. This saw can also be easily kept in perfect order, and the tooth will retain its original shape by the proper use of the file, as directed in the article on the Lumberman. A Gauge for reducing the length of cleaner teeth will accompany each Saw.



THE NONPAREIL.

The Nonpareil, of which the accompanying cut is a representation, is composed of sections of four cutting teeth, each section intersected by a cleaner tooth. It will be observed that the cavities on each side of the cleaner teeth are much larger and deeper than those of the cutting teeth, serving as a receptacle or chamber for dust, and effectually freeing the Saw during the operation of cutting. The cleaner teeth should always be kept shorter or lower than the cutting tooth. (The Gauge, as shown below, is made expressly for this purpose, and by its use the cleaner teeth of any Saw can be regulated and kept of exact length.)

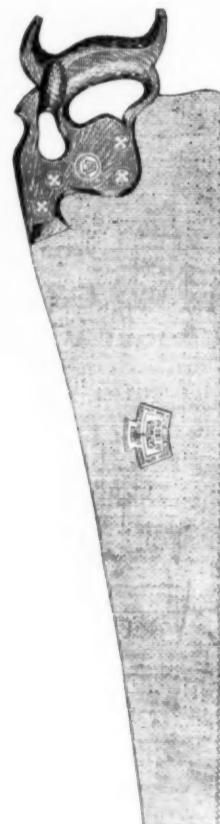
This Saw has given unbounded satisfaction wherever it has been used, and we are constantly receiving orders for the same; in fact, in some sections, and for sawing soft lumber, it is preferred to any other Saw.



DISSTON'S NONPAREIL SAW



CENTENNIAL No. 76.



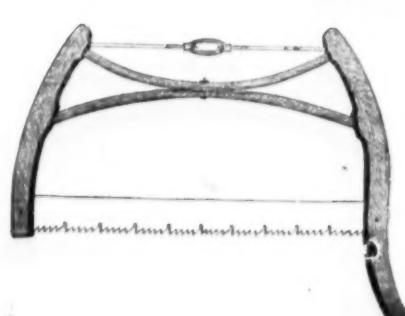
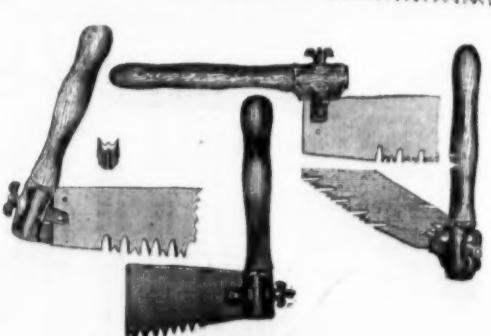
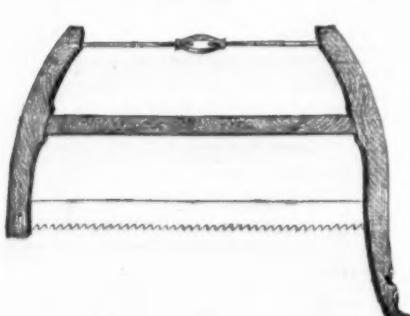
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FULL COMBINATION SAW.



No. 1, California Flat Back, Clock Spring Blade.



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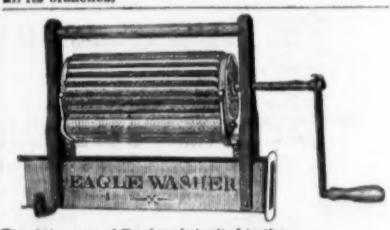
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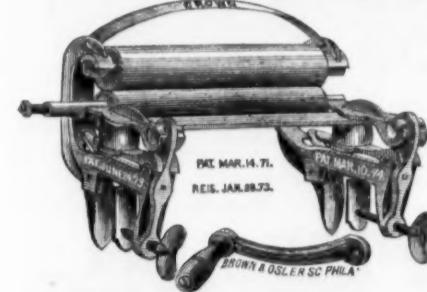
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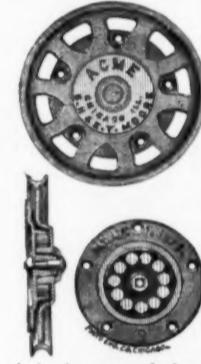
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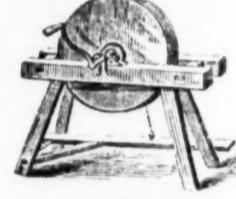
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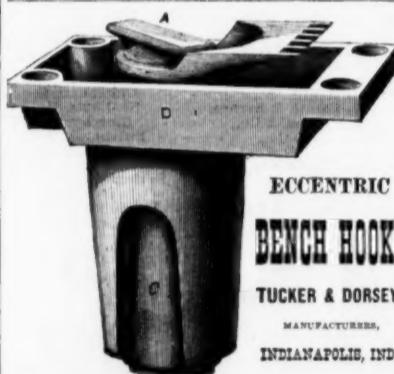
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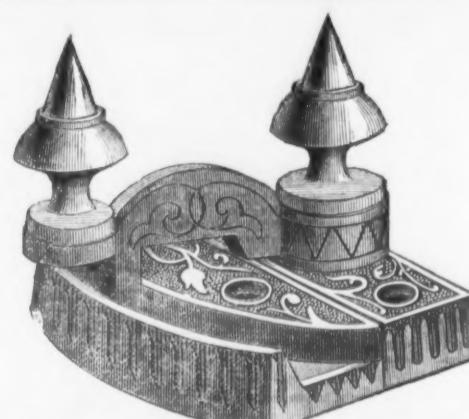
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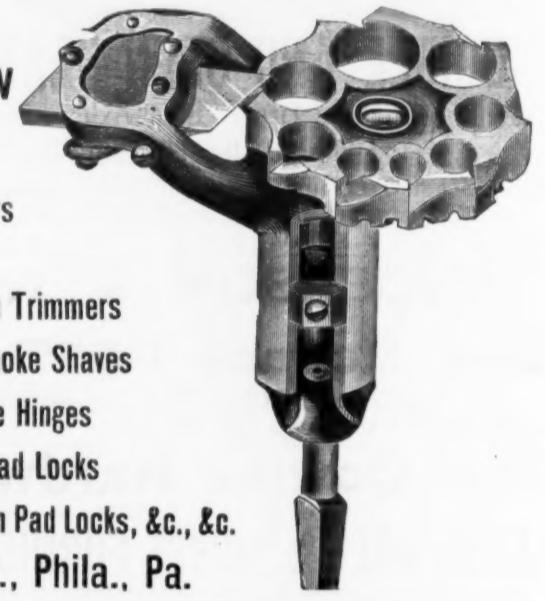
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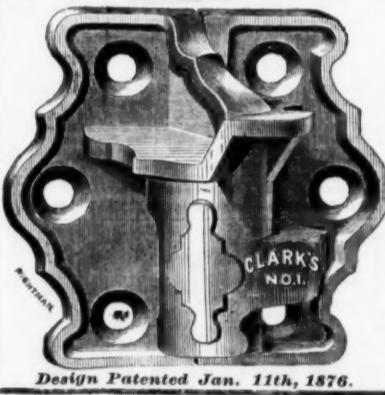
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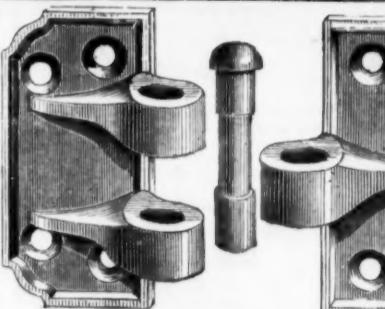
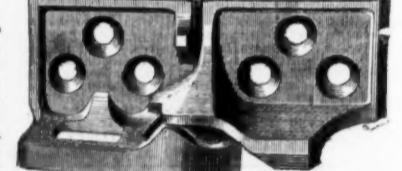
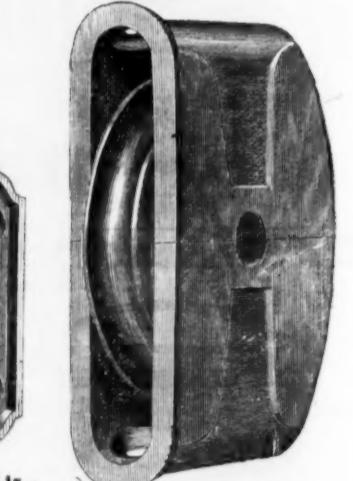
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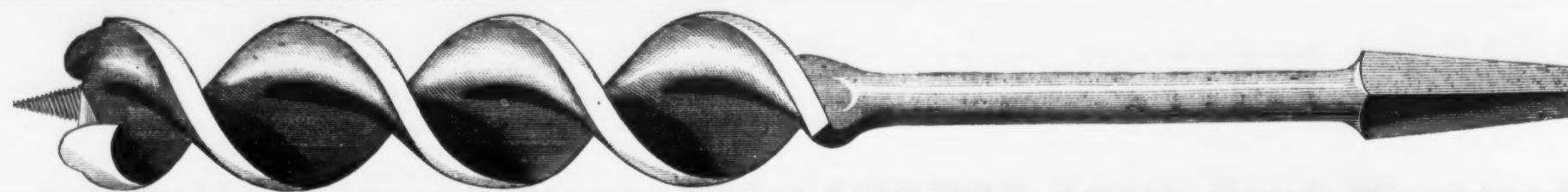
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SCOFIELD PATENT SHAFT STRAIGHTENER
meets just such a want; the apparatus is light and can be easily handled, yet it is of sufficient strength for the purpose required. It can be placed upon the shears of the lathe, and moved along the entire length of the work. It is especially

Adapted to Removing Short Bends,
which frequently occur in long lengths of shafting. The lightness of the Straightener renders it eminently

Adapted for Line and Counter-Shafting,
without necessitating the time and trouble of removing hangers and detaching couplings, but can be
Easily applied to the Shaft while in Position.
It can also be used on the bench for short lengths.

For Circulars, Price List, &c., Address,

C. SCOFIELD & CO.,
Vineland, N. J.

OVER 300 IN SUCCESSFUL OPERATION. The "Dead Stroke" Power Hammer

With Belden's Recent Improvements.

Guaranteed the best in Every Essential. Takes Less Room, Less Power, and costs Very much Less for Repairs than any other. Send for descriptive circular with names of over 200 using them—(to whom we refer.)

THE HULL & BELDEN CO.,
DANBURY, CONN.

If we are advised as to the average work for which hammer is required, we will furnish the proper size and guarantee satisfaction or no pay.

WE ALSO MANUFACTURE
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THE "CLIMAX" PIPE WRENCH,
(Latest and Best.)

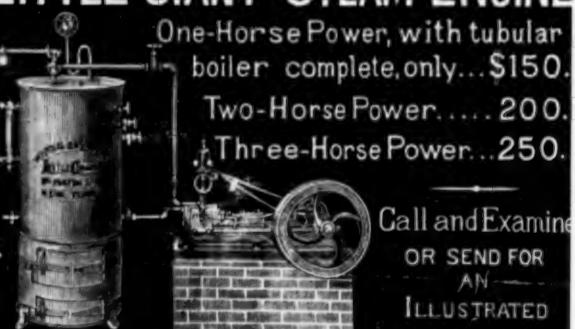
THE "DANBURY" DRILL CHUCK,
(Recently Improved and reduced in price.)

Hardware Specialties to Order. Models, Dies and
IRON & STEEL DROP FORGINGS.

SNYDER'S LITTLE GIANT STEAM ENGINE

The Best
SMALL
POWER ENGINES
IN THE COUNTRY.

Manufactured by
WARD B. SNYDER,
84 Fulton St.,
NEW YORK.



One-Horse Power, with tubular boiler complete, only... \$150.

Two-Horse Power.... 200.

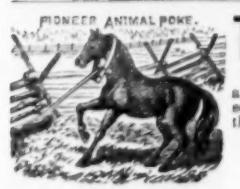
Three-Horse Power... 250.

Call and Examine
OR SEND FOR
AN
ILLUSTRATED
CATALOGUE.

The Old Reliable Pioneer Poke.

The only Poke made with an oil tempered Cast Steel Spring. Our Pokes are manufactured under the personal supervision of the proprietors themselves, from the very best selected Oak and Hickory Timber, and finished in the very finest style. We warrant our goods to be first-class in every respect. For further particulars and price please address

BISHOP & BENEDICT, Berea, Ohio.



THE "DUCKHAM" PATENT Suspended Self-Indicating WEIGHING MACHINE.

Capacities from 1 to 100 tons.

This machine is used on a crane or any lifting apparatus, and indicates the weight on the dial directly the article is lifted. It is accurate, requires no adjusting, portable, and the greatest labor-saving weight ever introduced.

Send for Circular and Price List.

JOHNSON'S PATENT UNIVERSAL LATHE CHUCK.

We invite attention to the superior construction of this chuck. Its working parts are absolutely protected from dirt and chips. It is strong, compact and durable, and will hold the greatest variety of work, as the jaws are adjustable with a range the full diameter of the chuck. For Price List address,

Lambertville Iron Works, Lambertville, N. J.

BUFFALO Bellows Factory and Planing Mill.

ESTABLISHED 1852.

JOSEPH CHURCHYARD, Contractor, Builder

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Manufacturer,
CLINTON, cor. ADAMS STS.,
Buffalo, N. Y.

SASH, BLINDS DOORS,

Cisterns, Tanks, Stairs, Hand Rails, Newels, Mirror Frames, Mantels, Curtain Cornices, Book Cases, Veneered Doors, Mouldings, and complete interior and exterior finish for houses.

ROUGH AND PLANED LUMBER,
Flooring, Siding, Shingles, Lath and Fence Posts.

Blacksmiths' & Moulder's Bellows.

J. CLARK WILSON & CO., Agents,

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Manufacturers of

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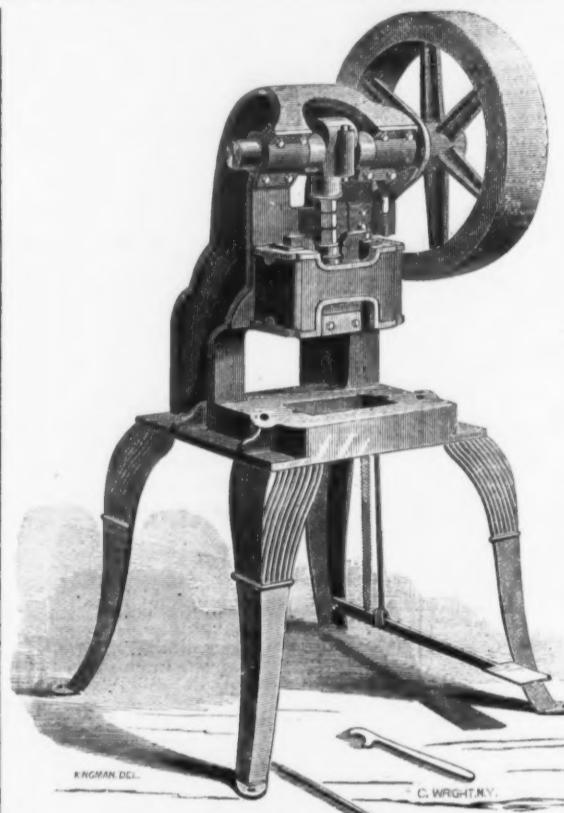
Bellows.

SCOTT'S

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C. A. & W. L. TEAL, Manufacturers of IMPROVED BENDING ROLLS

Arranged for
Removing Work from the end of top
roll.

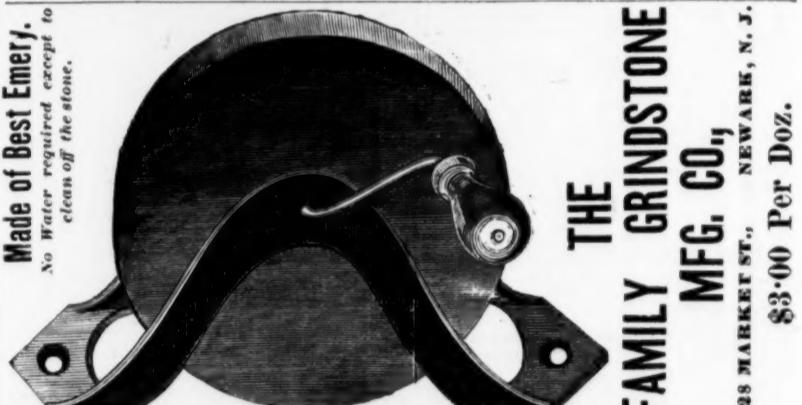
COMBINED
Punching and Shearing Ma-
chines, Single Power Punch-
ing Machines with Shearing Attach-
ments. ROTARY SHEARING Ma-
chines, Steam Riveting Ma-
chines. "Atherton's" Patent
"Cam," Steam Engines, Hair
Picking Machines and
MACHINERY

in general.

We would call special attention to the
above engine, as it has the same leverage on
the driving shaft at every point of the
stroke that the "crank" has at its strongest
point, making the engine run as well
as a more powerful engine.

4116 Ludlow St., Philadelphia.

CENTENNIAL SPACE, SECTION C. 3, COLUMNS 25 & 26, MACHINERY HALL.



NORTHWESTERN HORSE NAIL CO.

ESTABLISHED IN 1862.

HAMMERED AND FINISHED HORSE NAILS.

We offer our Finished Nail to the trade with the
confidence that it has no equal in the market. It is the
genuine "Northwestern" Nail, Finished, and we give it our
unqualified guaranty.

Office and Factory, 56 to 68 Van Buren st., Chicago.

A. W. KINGSLAND, Secretary.

GLOBE NAIL COMPANY,

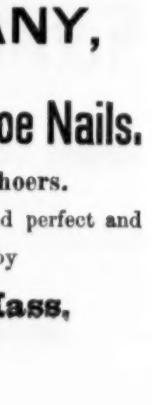
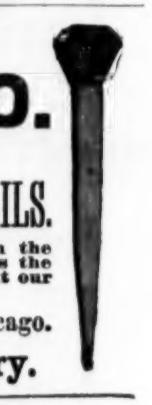
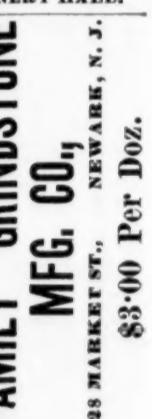
MANUFACTURERS OF

Pointed, Polished & Finished Horse Shoe Nails.

Recommended by over 20,000 Horse Shoers.

All nails made from best NORWAY IRON, and warranted perfect and
ready for driving. Orders filled promptly and at lowest rates by

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328 MARKET ST., NEWARK, N. J.

\$3.00 Per Doz.

167 to 173 Plymouth Street, Cor. of Jay, Brooklyn, N. Y.

OLIVER'S CHILLED PLOWS.



These implements, though but four years before the public in their present form, show the following remarkable record :
 1506 were sold in the season of 1871. 7472 were sold in the season of 1873. 31,077 were sold in the season of 1875.
 3,949 " " 1872. 14,976 " 1874. 42,139 having been sold the past spring.

The sales for 1876, will undoubtedly exceed 60,000 Plows. For full descriptive circulars, address,

SOUTH BEND IRON WORKS, South Bend, Ind.

IMPROVED DERINGER REVOLVERS.

No. 1, 22 Calibre; No. 2, 32 Calibre, Long Cartridge.



Cut Represents No. 2, 32 Calibre, 5 Shot. Size reduced one-third.

Exact Model of S. & W. No. 1 and No. 1 1/2 Revolvers.

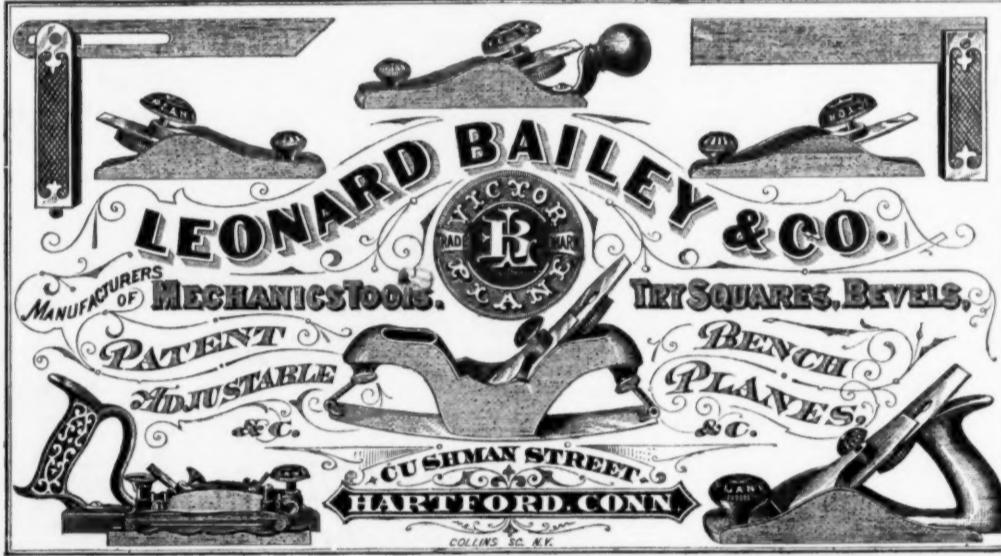
These Arms are Half Nickel Plated and are equal in style of finish to the best Arms in the country. Quality of workmanship and material first-class; warranted. Price less than any other Bling Barrel Cartridge Revolver of same quality in the market.

SOLE AGENTS :

EDW. K. TRYON, Jr., & CO., Dealers in FIRE ARMS,

No. 19 North Sixth Street and 220 North Second Street, PHILADELPHIA, PA.

THE VICTOR PLANES
 Are the most simple, compact and practical Adjustable Planes ever offered to the public. They are made under the personal supervision of Mr. L. BAILEY, the original inventor of L. BAILEY'S PATENT ADJUSTABLE IRON PLANES. All our Planes have our Trade Mark. Send for Catalogue, embracing Planes, Try Squares, Bevels, Rules, Levels, Hammers, Mitre Boxes, etc., etc.

THE BILLINGS & SPENCER CO.,
HARTFORD, CONN.

MANUFACTURERS OF

Die Plates and Dies, Genuine Packer Ratchet Drills, Clamp, Die and Common Lathe Dogs, Barwick Wrench and Pipe Tongs, the Billings Patent Sewing Machine Shutters, Marlin Spikes, Calkers' Tools, Clinch Rings, Saw Sets, Screw Drivers, and all description of IRON AND STEEL

Drop Forgings.

Send for a Circular.



RICHARD DUDGEON,

No. 24 Columbia Street, New York,

MAKER AND PATENTEE OF

Hydraulic Jacks and Punches,
ROLLER TUBE EXPANDERS
And Direct-Acting Steam Hammers.

Communications by letter will receive prompt attention.

JACKS for Pressing on Car Wheels or CRANK PINS made to order

GOLD MEDAL

Non-Extensible Razor Belt.

PATENTED JULY 25, 1871.

RE-ISSUED MAY 13, 1873, and JUNE 9, 1874.

In this Strap the liability of the leather to stretch and become loose and porous is prevented by the use of a patented non-extensible base, which supports the leather and secures

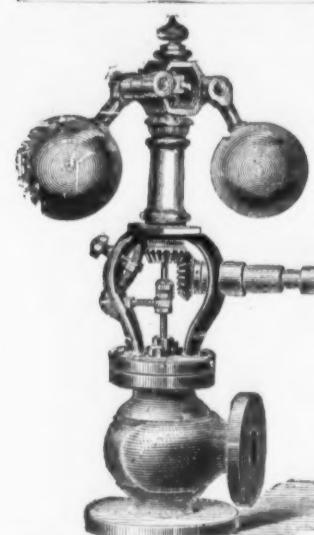
PERMANENT ELASTICITY.

We make this style with single rod, double rod, and wood frames, and intend that it shall, in quality compare favorably with our other well known brands.

BENJAMIN F. BADGER & SON, Manufacturer

Badger Place, Charlestown, Mass.

Solder—F. S. & Co.'s make	18c	Wrought Scrap Iron.....	per ton.
Best Fine	18c	Old Rails.....	
No. 1	18c	Eng. Tool, gold	15½c
Roofing	18c	American Tool	14c
Braziers or Solder Solder	30 to 38c	Mach	8½c
Antimony	22c	Boscombe	6½c
Bismuth Metal—F. S. & Co. s.	15c	Tin Plate.....	6½c
No. 2	15c	1. C. Coke 10x14.....	6½c
Sheet Iron—		2. Char. Roof. 1C. 14x20, 7' 0"	Bolt.....
Smooth, Common. com. Charcoal, Jumbo	18c	Sheathing.....	5c
23 & 26c. 4 c. 5½c	18c	Tire.....	5c
27. 4½c	9c	Sleigh Shoe.....	4½c
25 & 26. 14c	9c	Top Bar.....	6c
	10c	Spikes.....	6c
Galvanized Iron.....	30 to 38c	Copper.....	6c
Common. com. Charcoal, Jumbo	18c	Ingot.....	23½c
No. 24. 3½c	18c	Eng. Tool, gold	15½c
25 & 26. 4 c	18c	Char. Roof. 1C. 14x20, 7' 0"	Bolt.....
27. 4½c	5½c	Sheathing.....	5c
25 & 26. 14c	10c	Tire.....	5c
	10c	Sleigh Shoe.....	4½c
Russia Iron—		Top Bar.....	6c
Forgings	18c	Spikes.....	6c
American Russia—	18c	Copper.....	6c
A	18c	Ingot.....	23½c
Lend—		Eng. Tool, gold	15½c
Pig	18c	Char. Roof. 1C. 14x20, 7' 0"	Bolt.....
Red	18c	Sheathing.....	5c
Wire—bright.	18c	Tire.....	5c
Coppered	18c	Sleigh Shoe.....	4½c
	18c	Top Bar.....	6c
	18c	Spikes.....	6c
	18c	Copper.....	6c
	18c	Ingot.....	23½c
	18c	Eng. Tool, gold	15½c
	18c	Char. Roof. 1C. 14x20, 7' 0"	Bolt.....
	18c	Sheathing.....	5c
	18c	Tire.....	5c
	18c	Sleigh Shoe.....	4½c
	18c	Top Bar.....	6c
	18c	Spikes.....	6c
	18c	Copper.....	6c
	18c	Ingot.....	23½c
	18c	Eng. Tool, gold	15½c
	18c	Char. Roof. 1C. 14x20, 7' 0"	Bolt.....
	18c	Sheathing.....	5c
	18c	Tire.....	5c
	18c	Sleigh Shoe.....	4½c
	18c	Top Bar.....	6c
	18c	Spikes.....	6c
	18c	Copper.....	6c
	18c	Ingot.....	23½c
	18c	Eng. Tool, gold	15½c
	18c	Char. Roof. 1C. 14x20, 7' 0"	Bolt.....
	18c	Sheathing.....	5c
	18c	Tire.....	5c
	18c	Sleigh Shoe.....	4½c
	18c	Top Bar.....	6c
	18c	Spikes.....	6c
	18c	Copper.....	6c
	18c	Ingot.....	23½c
	18c	Eng. Tool, gold	15½c
	18c	Char. Roof. 1C. 14x20, 7' 0"	Bolt.....
	18c	Sheathing.....	5c
	18c	Tire.....	5c
	18c	Sleigh Shoe.....	4½c
	18c	Top Bar.....	6c
	18c	Spikes.....	6c
	18c	Copper.....	6c
	18c	Ingot.....	23½c
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	18c	Tire.....	5c
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	18c	Top Bar.....	6c
	18c	Spikes.....	6c
	18c	Copper.....	6c
	18c	Ingot.....	23½c
	18c	Eng. Tool, gold	15½c
	18c	Char. Roof. 1C. 14x20, 7' 0"	



TO ALL WHO USE STEAM- POWER!

We will put our Governor on any Engine, and guarantee it to prove itself superior to all others.

If, after a fair trial, it does not, we will take it off at our own expense.

Shive Governor Co. BETHLEHEM, PA.

ALSO,
SHIVE'S PATENT WATCHMAN'S
CLOCK AND DETECTOR,

AND
Buoy's Patent Counter Scale,
No Nest of Weights.

Circulars sent free.

Reduced Price List,

JANUARY 25th, 1876.

For dimensions of Governor, see Illustrated Price List.

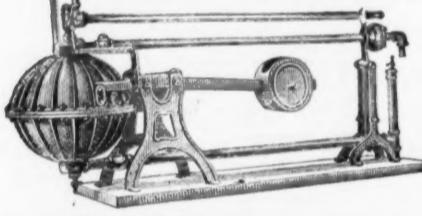
Size, Inch.	Plain	Bright Fin- ished	Extra for Lever	Stop Valve
3/8	\$17.00	\$19.00	\$1.90	..
5/8	19.00	21.00	1.90	..
1	21.00	24.00	2.00	\$5.00
1 1/2	25.00	28.00	2.25	6.00
2	29.00	33.00	2.50	8.00
2 1/2	32.00	36.00	2.75	10.00
3	35.00	41.00	3.00	14.00
3 1/2	45.00	51.00	3.50	15.00
4	49.00	56.00	3.75	17.00
4 1/2	64.00	73.00	4.50	25.00
5	74.00	84.00	5.00	30.00
5 1/2	94.00	108.00	6.00	42.00
6	110.00	128.00	6.00	48.00
6 1/2	125.00	138.00	7.00	54.00
7	150.00	165.00	8.00	68.00
8	185.00	202.00	9.00	80.00
9	205.00	225.00	10.00	..

Improved Steam Governor.

No Charge for Box & Cartage.

JUNIUS JUDSON & SON, Rochester, N. Y.

The Albany Steam Trap.

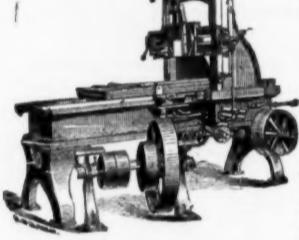


This Trap automatically drains the water of condensation from Heating Coils, and returns the same to the Boiler whether the Coils are above or below the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes. Apply to

Albany Steam Trap Company,
Albany, N. Y.

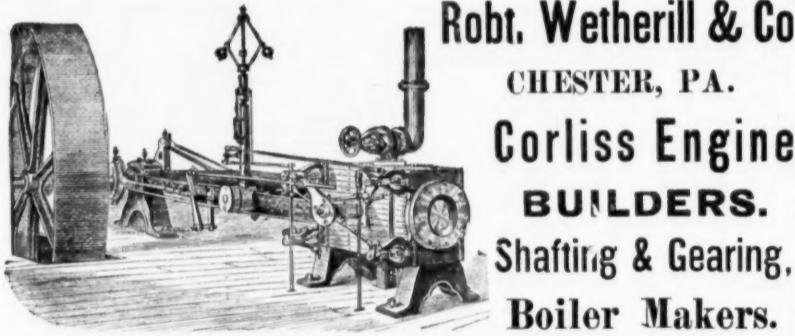
The Pratt & Whitney Co., Hartford, Conn.,

Have constantly on hand and making



Drop Hammers

Of recently Improved Construction. Pony Trip Hammers, Blacksmiths' Sheaves, Broaching and Stamping Presses, Iron Shop Cranes, Machinists' Tools, Gun and Sewing Machine Machinery. Make to order Gray and Charcoal Iron Castings of all styles and sizes not exceeding 15 tons weight, (making patterns if desired). Furnish Clamp Pulleys of light patterns, cut gears in a superior manner, &c., &c.



Robt. Wetherill & Co
CHESTER, PA.
Corliss Engine
BUILDERS.
Shafting & Gearing,
Boiler Makers.

THORNE, DeHAVEN & CO., Drilling Machines,
21st Street, above Market, Philadelphia.

PORTABLE DRILLS. Driven by power in any direction.
RADIAL DRILLS. Self-feeding—Large Adjustable Box Table.
VERTICAL DRILLS. Self-feeding.
MULTIPLE DRILLS. 2 to 20 Spindles.
HORIZONTAL BORING AND DRILLING MACHINES.
HAND DRILLS. CAR BOX DRILLS.
SPECIAL DRILLS. For Special Work.

BLAKE'S PATENT STONE & ORE BREAKER.

New Pattern with Important Improvements & Abundant Strength

For reducing to fragments all kinds of hard and brittle substances, such as STONE for making the most perfect MCADAM ROADS, and for making the best CONCRETE. It breaks stone at trifling cost for BALLASTING RAILROADS. It is extensively in use in MINING operations, for crushing

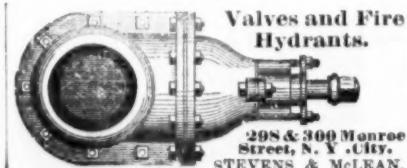
IRON, COPPER, ZINC, SILVER, GOLD, and other ORES.
Also for crushing QUARTZ, Flint, Eucry, Corundum, Feldspar, Cont., Barytes, Manganese, Phosphate Rock, Flu-spar, Soapstone, &c.

For Illustrated Circulars, and particulars, address.

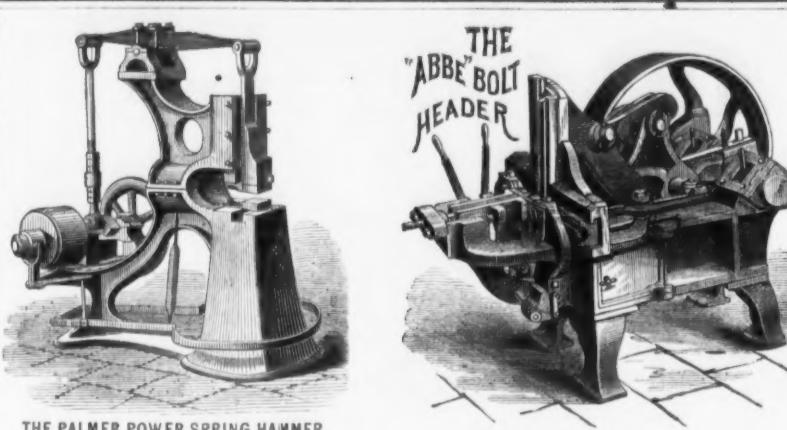
BLAKE CRUSHER CO., New Haven, Conn.



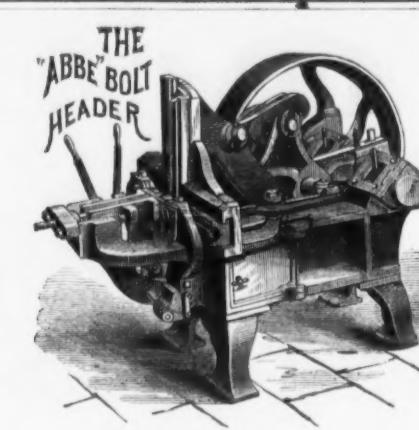
Stevens & McLean
298 & 300 Monroe St.,
New York,
AGENTS.



298 & 300 Monroe
Street, N. Y. City.
STEVENS & MCLEAN.



THE PALMER POWER SPRING HAMMER.



THE 'ABBE' BOLT HEADER.

Of these Machines we are building sizes to meet the requirements of all Manufacturers and Workers of Iron and Steel. In simplicity, durability, ease of operation, accuracy, and range of work, we guarantee them superior to any Machines of their kind produced in the world. For prices, references, and full descriptive circulars, address

S. C. FORSAITH & CO.,
Manchester, N. H.

P. BLAISDELL & CO.,
WORCESTER, MASS.,
Manufacturer of the
"BLAISDELL" UPRIGHT DRILLS
And other First-Class Machinists' Tools.

AMERICAN NATURAL OIL CO.
DEALERS IN ALL KINDS OF
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West Virginia Lubricating Native Rock Oil!
Used by most of the Railroads in the United States, Canada and Europe, and by Mechanics on all kinds of Machinery. The Safest, Cheapest and Most Reliable Lubricator in the world. Obtained at the best price at the Pure Express, 26, 29, 30 and 31 Gravity. No. 20 CEDAR STREET, NEW YORK.

The Whitmore Engine.
SAFEST, CHEAPEST & BEST.
Lovegrove & Co.,
No. 121 South Fourth Street,
PHILADELPHIA, PA.
Sole Manufacturers
Engines, Boilers and
Steam Pumps.

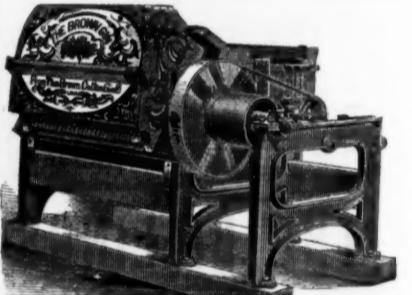
FRASSE & CO., 62 Chatham St. N. Y.

Importers of and Dealers in
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Steel Wire, Bar & Sheet Steel, &c.

BEST PIERCING SAWS
For Scroll Sawing.
French, German, English & American
TOOLS, FILES, STEEL WIRE AND
SUPPLIES.
Agents for the
ALMOND DRILL CHUCK.

OHL & HAUSCHILD,
Engineers & Machinists

And manufacturers of
Lathes, Shapers, Slotters, Planers, Gear Cutters,
Drill and Power Presses, Pulleys, Hand and Shaftings,
Machinery and Machinists' Tools in general.
57, 59 & 61 Passaic Avenue,
Kearney (East Newark), N. J.



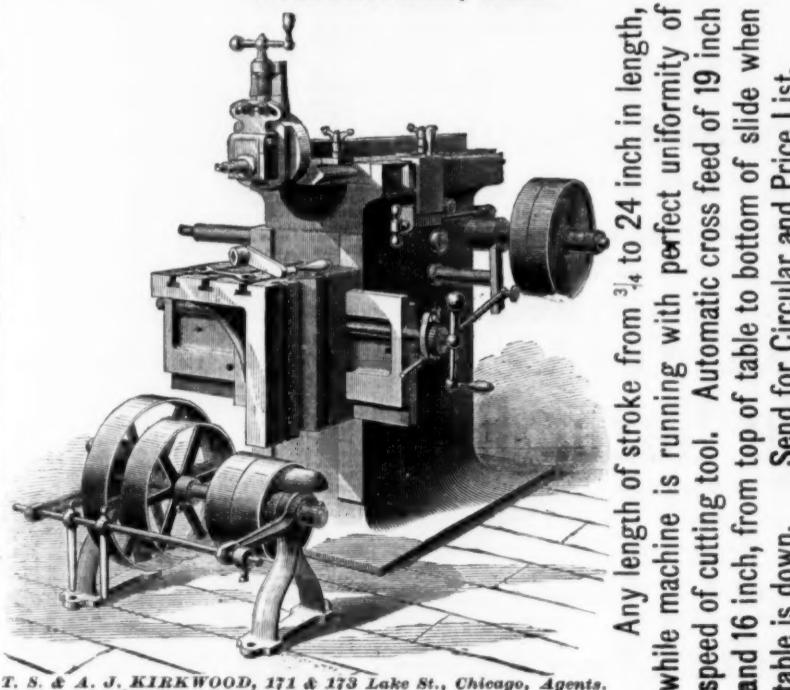
The Brown Cotton Gin Co.

NEW LONDON, CONN.
Manufacturers of
COTTON GINS,
With or without
Self-Feeding Attachment & Condenser.

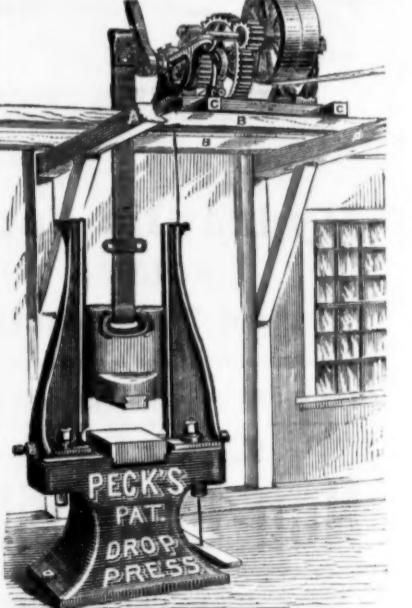
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Albertson's Segment Screw Cotton, and Hay
Press. Send for Circular.

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THE MANVILLE
Patent Planers and Shaping Machines.
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Any length of stroke from $\frac{3}{4}$ to 24 inch in length,
while machine is running with perfect uniformity of
speed of cutting tool. Automatic cross feed of 19 inch
and 16 inch, from top of table to bottom of slide when
table is down. Send for Circular and Price List.



I have the largest and best stock of Drop Press
Patents in the country—suitable for Forging, and all
kinds of Sheet Metal work.

WHY THE BEST:
It requires less power, works faster, gives a harder blow
with same weight of hammer, the rebound of the hammer
is much less, the blow is uniform, and not affected by variations in
the speed of the driver. It is always in order. The
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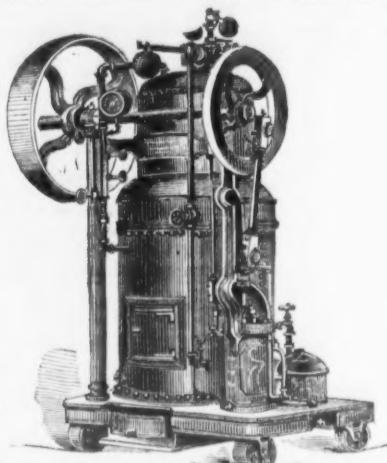
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COMPACT,
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\$200.00.Cheaper than any Engine offered of
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Binghamton, N. Y.Manufacturers of Steam Engines, Boilers, Water Wheels, Circular Saw Mills and
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Corner 16th & Buttonwood Streets
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Engineer, Machinist, Founder and Boilermaker
CASTINGS of every description.ROLLING MILL AND FURNACE EQUIPMENTS COMPLETE
Rolls Turned for Rails, Beams, Angles, and all shapes for Iron, Steel, or
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Keystone Pressure Blowers.
Anti-friction and noiseless; maximum blast and minimum power;
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Made on same principle.
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Manufacturers of the following Patented Articles of

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For Sale by all the principal Hardware Dealers.**Malleable Iron Castings**Of superior Quality and Hardware Specialties in
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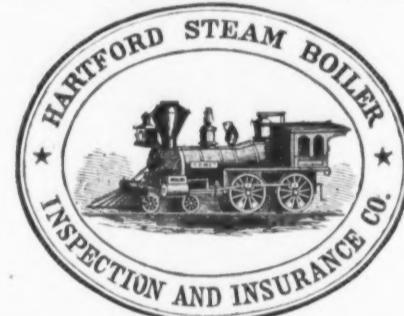
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COVERING ALL LOSS OR DAMAGE TO

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ARISING FROM

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Drills for Coes, Worcester, Hunter and other Hand Drill
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Machinery, &c.

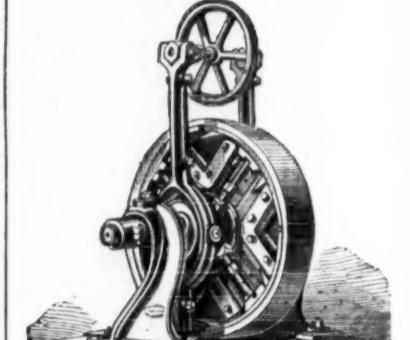
REPORT OF JUDGES

In Department F, Group 3, at the 44th
Exhibition of the
AMERICAN INSTITUTE,
Held in the City of New York, Oct., 1875.No. 318, Drawing, Drop &
Punching Presses.THE STILES & PARKER PRESS CO.,
Of Middletown, Conn.The machinery exhibited by these makers is of a
character that calls for great commendation. In
addition to their well known punch and press, to
which a new feature has been added in a press ad-
justable to an inclination for discharging work left
above the die, there are exhibited by them a com-
bined punch and shears, a drawing or blanking press,
and a drop.In all these there is shown the highest in-
chance, applied to meet every practical requirement,
to avoid every practicable expense to enlarge the
range of application of the machine, by devices
which are at once simple, elegant, and effective.Your committee would unhesitatingly recommend
for this exhibition the "Medal of Progress," but
find such award debarred by the rule of the Institute,
forbidding such award unless a Silver Medal has
been awarded to the exhibitor. We, therefore, respect-
fully recommend the award of a Silver Medal.Silver Medal Awarded.
A true copy from the Report on file.
JOHN W. CHAMBERS, Sec'y.AQUOMETER
Steam Pump.Highest Premium awarded by
Franklin Institute, 1874,
For Simplicity, Economy of
Construction & Efficiency.An absolutely Durable, Cheap, Efficient and Eco-
nomical Steam Pump. Requires no special care or
lubricating. Warranted. Address for circular.AQUOMETER STEAM PUMP CO.,
10 South Dela. Avenue, Philadelphia.DEAR SIR: The Wright Bucket Pump
you sent to us for trial, you
built for the Government "works like a
top." Am sure it has
never had its equal in
any of the departments,
and I have no hesitancy in
recommending this
Pump to any one in
want of a first-class,
noiseless Steam Pump.
Very respectfully,
J. THOS. MILLER,
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tives.

Send to us for Catalogue.

Valley Machine Co.

EUREKA SAFETY POWER!

Practically impossible to
explode. Testes 300
pounds per square inch. Will
lift 2 inch seasoned oak-grind
bushels Corn per hour. Price
\$250.00. Stationary Engines
Driving Portable Engines for
plantation use. Send for our cir-
cular. Discount to the trade.B. W. PAYNE & SONS,
Corning, N. Y.VOLNEY W. MASON & CO.,
Manufacturers of PATENTFriction Pulleys,
Friction Clutches

For Connecting Shafting and Gearing.

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Lafayette Street, PROVIDENCE, R.

TUBAL SMELTING WORKS,
760 South Broad Street, PHILADELPHIA.
PAUL S. REEVES,
MANUFACTURER OF
ANTI-FRICTION METALS.

XXX	Genuine	40c	C.	15c
XX	.....	38c	D.	13c
X	.....	32c	E.	11c
.....	.....	30c	F.	11c
.....	.....	28c	.....	.....

"Note."—The above are my standard mixtures, and have given satisfaction wherever used, but I am prepared to make Anti-Friction Metal of any quality or mixture desired by the purchaser.
BRASS CASTINGS, 21 to 30c. **INGOT BRASS,** 19 to 28c. **BRASS TURNINGS AND OLD METALS WANTED.**

ESTABLISHED 1842.

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PHILADELPHIA,

P. O. Address: Frankford, Philadelphia. MANUFACTURERS OF ALL KINDS OF

Elliptic, Platform AND C Springs,
MADE EXCLUSIVELY FROM

SWEDISH STOCK, OIL-TEMPERED and WARRANTED.

Swedish Tire, Toe, Blister and Spring Steel.

CAST SPRING AND PLOW STEEL.
CAST SHOVEL, HOE AND MACHINERY STEEL.

OXFORD TOE, SLEIGH, TIRE AND SPRING STEEL.
BESSEMER SHOVEL AND PLOW STEEL.
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RE-ROLLED NORWAY SHAPES.
NORWAY NAIL, RODS ROLLED AND SLIT FROM SUPERIOR BRANDS.

Iron Clad Can Co.,
23 CLIFF STREET, N. Y.



THIS CUT REPRESENTS THE

IRON CLAD
FIRE SHOVEL

We call the attention of the trade to our New Stove or Fire Shovel. It is far superior to anything in the market, for the following reasons:

It is made from one piece of Metal, both blade and handle; therefore is as cheap as the cheapest.

The handle being half round to catch dirt, it is always clean.

The handle being half round at the junction of the blade makes it the strongest Shovel ever manufactured, (where all other shovels fail.)

The upper part of the handle being round makes it the most convenient handle, and the same being hollow is always cool.

To convince yourselves of the above facts, send for sample.

IRON CLAD CAN CO.,
Manufacturers of STAMPED WARE, CAN TRIMMINGS, COAL HODS, Etc.
Send for Price List.

Edgar's Patent "Gem" & "U. S." Stove Shovels.



ENTIRELY ROUND HANDLE, Patented Feb. 22, 1876.

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DERBY SILVER CO., Derby, Conn.,
Manufacture the most reliable
SILVER PLATED SPOONS & FORKS.

They are plated by weight, and not by time or guess, containing 20 per cent. more silver than the usual standard, on a base of Nickel Silver, and finished by hand. Each article is guaranteed by the trade mark and warranted to give full satisfaction. We ask of the trade a fair and impartial test, assuring them that the high standard already attained, shall be maintained. Send for Catalogue and Price.



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BRASS FOUNDRY & METAL REFINING WORKS.
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A Specialty.

CARBON BRONZE
Castings for Cars, Mills and Machinery. Also supplied in Ingots to the trade. Guaranteed to be the safest and most durable Journal Metal made.

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No. 216 & 218 N. THIRD ST.
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STEEL CASTINGS.

A SUBSTITUTE for Steel and Wrought Forgings.

Circulars sent on application.

Steel Castings

We make Steel Castings true to pattern, sound and strong. Can be worked same as bar steel. Plowshares, Mold-boards and Land-sides, Anthracite Coal-breaker Teeth, Wheels and Pinions, Dies and Hammer Heads, Engines and Machinery Castings of all descriptions, Railroad Frogs and Crossings.

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Crucible Steel Castings

Light and Heavy STEEL CASTINGS of superior quality made on short notice, true to pattern, solid, strong and durable, can be readily forged and tempered.

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"Tyrone" Brand of Bar, Tank & Sheet
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Plates Rolled 100 inches wide.

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BOILER HEADS & FLUE HOLES
FLANGED TO ORDER.

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However great or
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positive uniform speed of Engine desired
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Improved French Casters

The simplest in construction and most reliable ever offered to the public. Can be put on and off the time, and more permanently than the ordinary kind. Send for Illustrated Catalogue.

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Small Gray Iron and Brass Castings.

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Manufacturers of
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AND OTHER
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Carriage Bolts made from Best Square Iron, a Specialty.

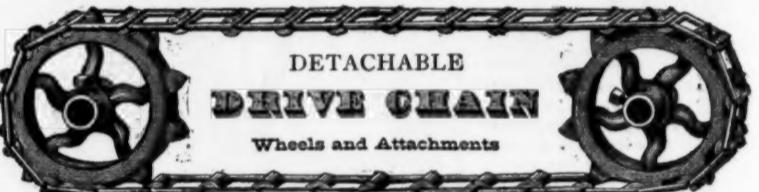


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7/16 in., No. 3, 4, 5, 15, 16.	2 3/4 in., No. 10, 12, 13, 14, 16, 17, 18, 20, 22, 24.
1/2 in., No. 5, 7, 10, 12, 13, 16.	3 1/4 in., No. 13, 14, 16, 17, 18, 22, 24.
1 in., No. 5, 15, 17, 20.	3 in., No. 9, 14, 24, 26.
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Positive transmission. NO Friction. Runs Fast or Slow, on all size wheels.

Stands EXPOSURE. Tension. Stretching. Runs Perpendicularly.

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